

# PUBLIC WORKS Magazine

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 78, No. 12

**W. A. HARDENBERGH and A. PRESCOTT FOLWELL**  
Editors

## DECEMBER, 1947, CONTENTS

### HIGHWAYS AND AIRPORTS

2-Way Radio Expedites Traffic on San Francisco Bay Bridge. By Fred E. Ebel	21
Contractor Cooperation Aids Asphalt Surfacing Program. By E. A. Roberts	30
An Economic Study of Interior-Block Parking. By Chas. S. Le Crow	31
"We Won't Be Caught Again." By John E. Hubel	33
Parking Meters in Colorado	33
How to Use Bulldozers	38
Sand Drainage Wells Save Money on Connecticut Highway	40
Rates for Private Facilities at an Airport	42
Price Trends in Highway Construction	51
The Highway and Airport Digest	58
Airports in Mexico	63
Hydrated Lime in Soil Stabilization to Be Studied	63

### SEWERAGE AND REFUSE

Observations on 2-Stage Biofilter Operation	24
A Model Incinerator for Amsterdam. By B. A. Kroup and R. S. Taggart	26
Flood Control for Johnstown. By A. H. McCaffrey	27
Factors in the Design of Model Waste Treatment Plants	29
A Two-Purpose Sewage Treatment Plant	32
A Practical Use for Puppy Love—in Sewer Cleaning	41
Mechanical Street Cleaning Saves Money	42
Treating De-Inking Wastes	44
The Sewerage Digest	52

### WATER SUPPLY AND PURIFICATION

The Gravity Flocculator for Water Treatment. By G. R. Frith and Lowell Cady	19
Construction Cost of Water Mains in St. Paul	28
Water Supply and Sewage Treatment in Anderson	32
Friction Loss in Valve and Reducers	32
Fluoride Treatment of Water in Lewiston	34
Creosoted Wood Piling Used in Kansas Dam	34
Working a Riverbed to Increase Well Water Supply	34
Determining Various Chlorine Compounds in Water	41
The Water Works Digest	45

### GENERAL

The Editor's Page	7
Letters to The Editor	8
New Rochelle Uses Modern Method of Surveying	32
Motion Picture Films of Road Construction	42
Making Water Wetter	51
Things That Are New in Equipment and Materials	66
For the Engineers' Library	69
Jobs for Engineers	74

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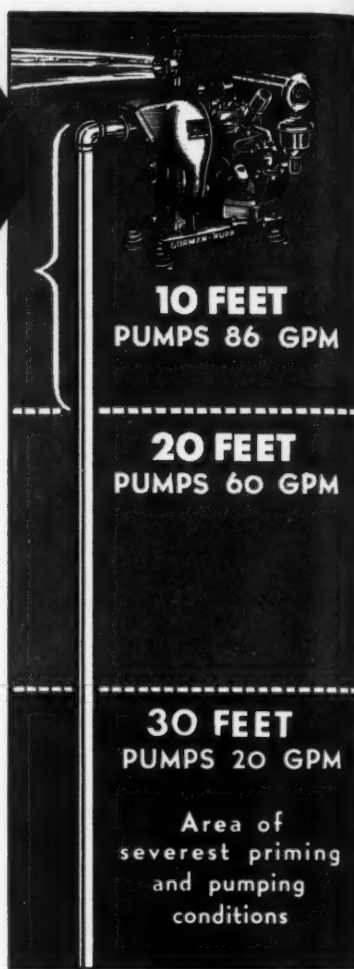


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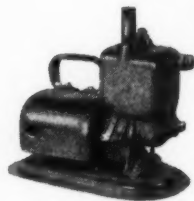
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# The Editor's Page

## Engineers and National Defense

During the early part of 1947, several bills were introduced into Congress which aroused the violent opposition of this magazine and of a great many engineers of vision and experience. One was passed—that creating the Medical Service Corps. This bill will probably be amended in the near future to meet the principal objections that engineers have raised to it. The proposed bill of the Public Health Service was not passed. This will be introduced again; its provisions been scanned closely and it is believed that there are no seriously objectionable features in it. There yet remains two large jobs to be done. The first is to salvage the Corps of Engineers from the non-technical status into which it has been pretty well placed. The second is to establish an organization which will effectively evaluate the service demands for engineers and will allocate them according to national need if another emergency arises. A beginning has been made on both jobs.

## Automobile Parking Space in Your Office Building

Automobile parking space is at a premium in every city and town. Many remedies have been proposed and tried. Parking meters are a fine temporary measure to reduce trouble while sound and permanent measures are being put into effect; but actual additional parking space is needed. Now comes a suggestion for the combination office and parking building. The offices are located at the periphery of the building, while the interior space, often largely unusable anyway, is devoted to a drive-up ramp and individual parking space on each floor. Open your office door, and there is your car!

## Highway Guide Markings for Private Flyers

There are something like a hundred thousand private flyers in this country, according to reliable estimates. To serve them, an unusually good suggestion, though not a wholly new one, has been made by L. B. Bartlett, Director of Public Works of Hamilton, O., who flies his own plane and therefore has a practical viewpoint. His idea is to paint on highways near cities and large villages, the name of the community and the highway or route number. Some years ago, New Jersey, we believe, did this as an aid to flyers. It is worth thinking about. And, incidentally, the name of the community would help automobile drivers to locate themselves.

## The Need for More Research

Our war experiences demonstrated to many the need for continuous intelligent research and development; but too many research appears to be needed only during times of national emergencies. At other times, the old method is good enough; and, anyway, there is too much routine work to do to mess with research. It is a dangerous frame of mind; progress is the only solution to the economy, not only of the nation but also of the individual company. One of our outstanding industrial firms has just opened the first unit of a vast and modern research center which is shown

briefly on another page. This is fine, but there should be more of them. Our own feeling is expressed pretty well by the policy of this office: If we have done it the same way for five years, it's past time we found a better way.

## Durable Structures Need Good Engineering

Once concrete is placed and has set, it cannot be improved; it will be as good or bad as when it was placed. A defective water pipe or sewer, several feet under the surface of the ground, can be improved, but only at a cost almost as great as the original. A sewage treatment plant poorly designed, improperly located, or slipshoddily built can never be worth the money spent on it. You can't move it, and you can't do much to improve it. Precisely the same applies to a street or a highway, or a building. When we go spending money on such permanent structures, they ought to be good. That means design by a qualified engineer; the use of the best materials; and honest supervision of the work as it is being done. The savings that can be attained by hiring a cheap engineer, using second-rate materials, or slighting the construction of the work are negligible when considered in any light; and over a long-time period they usually represent a startling loss to the community foolish or short-sighted enough to permit such procedures. Doing it right in the first place saves a lot of money and eliminates the need for a lot of alibis later on.

## Parking Meters as Tax Collectors

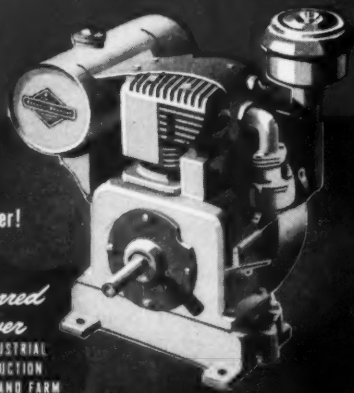
The parking meter seems to be another of those happy money-raising ideas, just as the gas tax was. No one objects materially to either, and the amount of money raised is astonishing. In one city less than 400 meters brought in around \$80 each per year at an administrative cost of about \$7 per year each. Bearing in mind the sad experience with gas taxes, and the amount of such funds that have been diverted to other than highway and allied purposes, we suspect that a good many cities are going to forget that parking meters are not a cure for traffic congestion, but merely a palliative; and that the money raised by them ought to be spent for the improvement of traffic conditions. A painless method of getting more money from the motorist is a powerful attraction to the average political incumbent.

## Gas Taxes and City Streets

Figures from a recent study of the American Public Works Association indicate that though city streets carry more than half of the motor vehicle traffic, cities receive only about 4½% of the money from gas taxes. It is true that both states and counties build and maintain some of the streets within corporate limits, though the amount spent on these does not appear to equalize the matter; and there are other conditions under which cities may receive gas tax money. However, the amount received is small and the time is likely to come when the question of the cities' share of this money will be vigorously discussed. The mounting costs of municipal government are pointing that way.



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## Letters

to the

Editor

### Welcome Back, Jack!

DEAR BILL:

This is 19 Nov., the seventh anniversary of going on active duty. My leave for 60 days in the US has come through and we are sailing to-morrow for San Francisco; thence to Iowa, and possibly Washington. I will be back in Frisco about Jan 1 for the return trip. My present job is Chief of Utilities, R & U Branch, L-3 Section, Engineer Section, Eighth Army. I find this work very interesting. My plans have been changed again. GHQ has requested that I stay on until next September (1948) and the Department of the Army has approved this. So I will be here for nearly another year yet (minus the time on leave). I am very anxious to see my three grandsons, all of whom have arrived since I left.

While I am in the United States, my address will be c/o Mrs. Dmitri M. Hailoff, 1883 Greenwich St., San Francisco 23, Calif.

JACK J. HINMAN, JR.

Colonel, Corps of Engineers.

(Ed. Note: The above is our own abstract of a long and interesting letter from Col. Hinman.)

### A Big Order; We Did the Best We Could

DEAR SIR:

Enclosed is check for PUBLIC WORKS Magazine. I would also like to know if you have any, or know of anyone that has, handbooks on the following: Street and road grading; paving; sanitary and storm sewers and manholes and catch basins.

FRED A. MAGGI, Tennessee

### Let's Hear From the Lagoon Cleaners

DEAR SIR:

Three-fourths of the sludge from our sewage treatment works is handled by lagooning. The equipment provided for cleaning the lagoons consists of an 18-ton clam shell crane and International single wheel trucks. Due to the spongy condition of the bottoms of the lagoons, plus the dampness and slipperiness, our equipment for lagoon emptying must be reinforced. I want to recommend the purchase of new equipment and I wonder if your Highway and Airport Manual would be of value.

(Turn to page 10)



# Bonus Built

## THE AMAZING RESULT OF AN ENGINEERING PRINCIPLE THAT ASSURES LONGER TRUCK LIFE ... And ONLY Ford Trucks Have It!

Coming for 1948—a brand new line of  
Ford Trucks . . . new all through . . .  
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Soon you'll see the great new line of Ford Trucks—great not only because they are *new all through*, but because they are the amazing result of a time-proved truck building principle.

This principle is Ford **Bonus Built** construction. Here's what it means to you:

Every one of the new Ford Trucks for '48 is built with *extra strength* in every vital part. This extra strength provides **WORK RESERVES** that pay off in two important ways:

First, these **Bonus Built** **WORK RESERVES** give Ford Trucks a greater *range of use* by permitting them to handle loads beyond the normal

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Not ONE Capacity . . . but real **RANGE** when needed!

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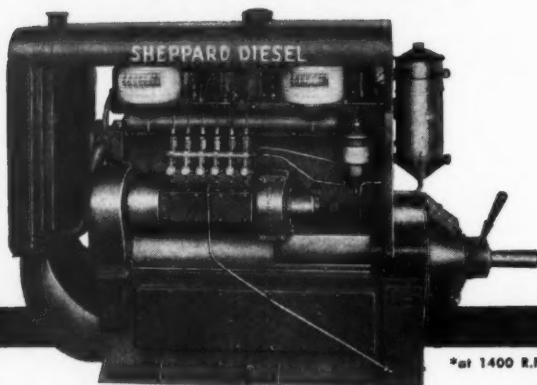
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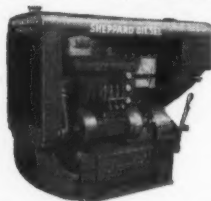
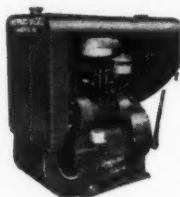
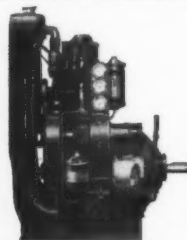
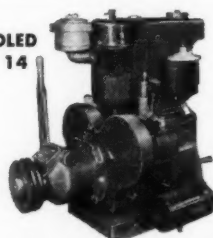
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Model 13D - 2 cylinders, 18 H.P.Model 7 - 1 cylinder, 8 H.P.  
Model 7D - 1 cylinder, 9 H.P.AIRCOOLED  
Model 141 cylinder, 3 1/2 H.P. at 1800 R.P.M.  
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to me along that line. If it would be I would appreciate receiving a copy and while mailing that one, I would also appreciate a copy of your latest Sewerage Manual.

Any help you can give me on equipment for lagoon cleaning will be greatly appreciated. From what I can find out this would be a real field for discussion for PUBLIC WORKS Magazine.

RALPH A. HOOT, Superintendent  
Sewage Treatment Works

(Ed Note: Discussion is invited. Let us hear about your experiences.)

### More of Training Programs

DEAR SIR:

In your July and September issues, an outline for an on-the-job training program for Water Department personnel was given. This material was of much interest to me, being a veteran training for water plant operation. Please send me information on how to obtain text at a discount for students, as mentioned in these articles.

R. J. WATERMEIER, Illinois

### We Got a Lot of These Requests—And Answered Them

DEAR SIR:

I would like to obtain the address of the Interstate Commission on the Potomac River Basin which has issued the "waste treatment guide" described in the October issue of PUBLIC WORKS. If you can furnish this information, it will be greatly appreciated.

A. M. BUSWELL, Illinois.

### A New One Is Coming Soon

DEAR SIR:

I am taking advanced work in sanitary engineering under Prof. A. E. Williamson. A very fine source of information on trickling filter design is the handbook published by PUBLIC WORKS. If you have a copy of this handbook available, I would appreciate having one for my personal file.

ADOLPHUS MITCHELL,  
North Carolina.

(Ed. Note: A new handbook is now in preparation which will contain the series on trickling filters published during 1947. Copies of the articles were sent Mr. Mitchell.

### Forwarded With Pleasure

DEAR SIR:

In the issue of PUBLIC WORKS for September, 1947, there appears an article entitled "How to Design Imhoff Tanks and Trickling Filters for Schools, Camps and Hotels," in which it is stated that the Editor, upon request, will forward data covering small rotary and fixed nozzle distributors. We shall appreciate your forwarding this data to us for our general information and files.

C.C. MACK,  
Ass't Com'r,  
National Housing Agency

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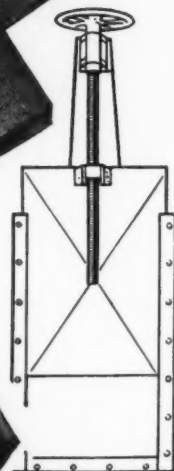
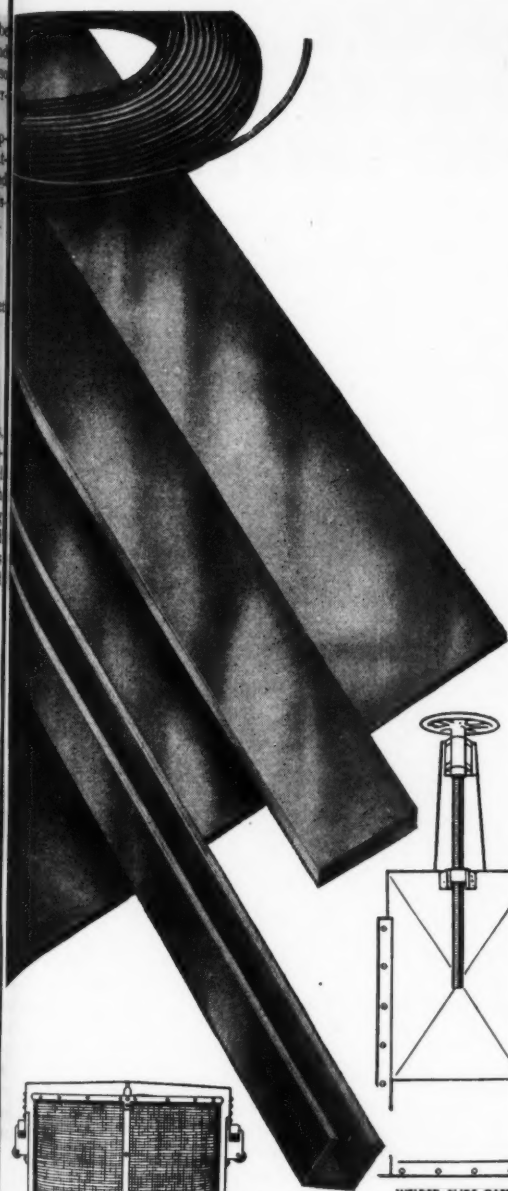
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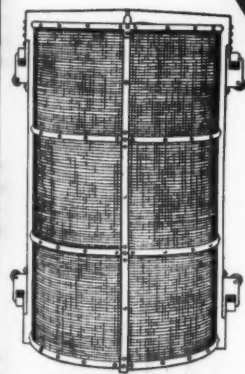
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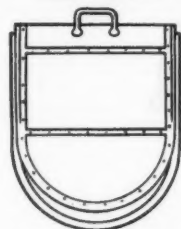
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WELDED SLIDE GATES

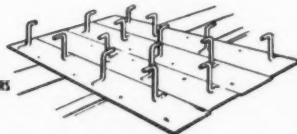


SCREEN WIRE AND FRAMES

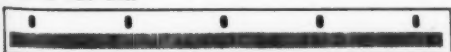


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WITH WELDED ANCHORS



SLOTTED WEIR PLATES



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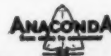
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# HERE 'TIS A COMPLETE ENGINEERING HANDBOOK ON BELT CONVEYORS

### Standard Belt Conveyor Terminals

Capacity, Maximum Centers, Horsepower Rating and Belt Specifications

Belt Width	Terminal Number	(1) Capacity in TPH at 100 FPM for Various Weights of Materials				(2) Maximum Horizontal Centers for Various Weights of Materials				(3) Belt				HP to Deduct for Each 100' Conveyor Center at 100 FPM for Various Weights of Material
		20	30	40	50	20	30	40	50	Min. Pitch	Max. Pitch	Min. Pitch	Max. Pitch	
42"	92724-B	90	100	120	130	400	500	600	700	4	4	4	4	7.6
	92724-L	90	100	120	130	400	500	600	700	4	4	4	4	
	92724-S	90	100	120	130	400	500	600	700	4	4	4	4	
	92824-B	90	100	120	130	400	500	600	700	4	4	4	4	
	92824-L	90	100	120	130	400	500	600	700	4	4	4	4	
	92824-S	90	100	120	130	400	500	600	700	4	4	4	4	
	92924-B	90	100	120	130	400	500	600	700	4	4	4	4	
	92924-L	90	100	120	130	400	500	600	700	4	4	4	4	
	92924-S	90	100	120	130	400	500	600	700	4	4	4	4	
	93024-B	90	100	120	130	400	500	600	700	4	4	4	4	
	93024-L	90	100	120	130	400	500	600	700	4	4	4	4	
	93024-S	90	100	120	130	400	500	600	700	4	4	4	4	
48"	92724-B	110	120	130	140	400	500	600	700	4	4	4	4	7.6
	92724-L	110	120	130	140	400	500	600	700	4	4	4	4	
	92724-S	110	120	130	140	400	500	600	700	4	4	4	4	
	92824-B	110	120	130	140	400	500	600	700	4	4	4	4	
	92824-L	110	120	130	140	400	500	600	700	4	4	4	4	
	92824-S	110	120	130	140	400	500	600	700	4	4	4	4	
	92924-B	110	120	130	140	400	500	600	700	4	4	4	4	
	92924-L	110	120	130	140	400	500	600	700	4	4	4	4	
	92924-S	110	120	130	140	400	500	600	700	4	4	4	4	
	93024-B	110	120	130	140	400	500	600	700	4	4	4	4	
	93024-L	110	120	130	140	400	500	600	700	4	4	4	4	
	93024-S	110	120	130	140	400	500	600	700	4	4	4	4	

(1) Capacity and Centers are in direct proportion to belt speed in FPM.  
 (2) Effect of the conveyor need not be considered when checking for capacity.  
 (3) Based on normal maximum allowable belt stress.  
 (4) Based on 100 FPM terminal velocity.  
 (5) Based on 100 FPM terminal velocity.

### Standard Belt Conveyor Terminals

Machinery Specifications      Conversion Table

Terminal Number	Handshaft				Countershaft				Powershaft				Belt Shaft				Belt Width	Belt Speed	Belt Weight	Belt Life	Belt Cost	Belt Price	Belt Life	Belt Cost
	Shaft	Pin	Roller	Pin	Shaft	Pin	Roller	Pin	Shaft	Pin	Roller	Pin	Shaft	Pin	Roller	Pin								
92724-B	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92724-L	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92724-S	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92824-B	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92824-L	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92824-S	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92924-B	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92924-L	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
92924-S	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
93024-B	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
93024-L	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10
93024-S	3/4"	10	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	3/4"	10	10	10	10	10	10

Example Explaining Use of Standard Belt Conveyor Terminals, Pages 8 to 13 inc.

A set of terminals is required for a belt conveyor 30' wide handling coal at 50 lbs. per cu. ft. at a rate of 80 TPH at 100 FPM, 150' center to center of pulleys, on an incline, with a total life of 460'.

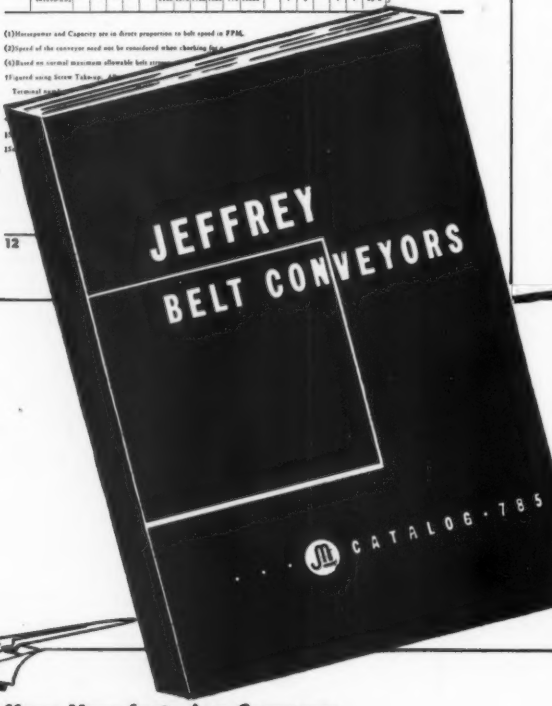
First convert the inclined conveyor centers of 150' to an equivalent horizontal conveyor centers by the following method: In the conversion table opposite the 30' conveyor, (page 11) it is seen that 14.7' horizontal centers per foot of life must be added for each foot of life and as 460' life is required, 460 x 14.7 or 6762 feet must be added to the 150' which gives an equivalent horizontal conveyor of 826' centers.

Terminal 30724-L has a maximum center

rating of 950' requiring 5.7 HP. Since 826' centers or 124' less is required, this terminal can be used and the HP required is figured as follows: From the HP deduction column it is found that .058 HP may be deducted for each 100' less than maximum centers, therefore 5.7 - (.058 x 12.4) = 5.0 HP at the headshaft. Additional HP must be added for the drive machinery. (See page 26.)

A similar procedure is followed when one or more trippers are used.

After the terminal is selected multiply the HP figured for 100 FPM, as in example, by the speed required and then divide by 100. This will give the HP at the headshaft for the speed the conveyor will travel.



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# Model 10

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- Operate automatically on the closed circuit principle.
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- Model 10 efficiency frequently results in the authorization of faster train schedules.

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**G19 - PW12**



**H**OW can a ton of water (240 gallons) be collected, processed and delivered to the faucet, for less than a dime?

Because public water supply is a big industry—seven times bigger in tonnage volume than the combined product of all other industries—delivering an indispensable product without a substitute. This is part of the reason but not the big part.

More than half of the capital investment of public water supply systems in this country is in distribution mains, usually financed by bond issues with an average term of 30 years.

If these mains had to be dug up and replaced every 30 years—either because of failure or ruinous maintenance costs—water could *not* be sold for anything like a dime a ton.

But over 95% of all the water distribution mains in this country are cast iron mains with a known efficient life of at least 4 times the average term of an issue of water works bonds.

Cast iron mains go on serving for generations after the bonds issued to pay for them are retired and forgotten—saving millions in avoided replacement costs and millions in maintenance. A big reason why a ton of pure water costs less than a dime is the long life and efficient life of cast iron pipe. Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 S. Michigan Avenue, Chicago 3.

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MIXING BLACKTOP . . . all wheels miss the windrow.



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CLEANING A WET DITCH . . . keeping rear truck on road.

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No Motor Grader without All-Wheel Drive and All-Wheel Steer can hope to equal the all-around operating efficiency of the Austin-Western "99-H" Power Grader, with its High-Lift Blade, Extreme Blade Reach and Completely Reversible Blade.

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All-Wheel Steer provides unequalled maneuverability; saves time on every job; makes it possible to work in places where ordinary motor graders cannot go—do things they cannot do.

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SLOPING A BANK . . . using high-lift blade.

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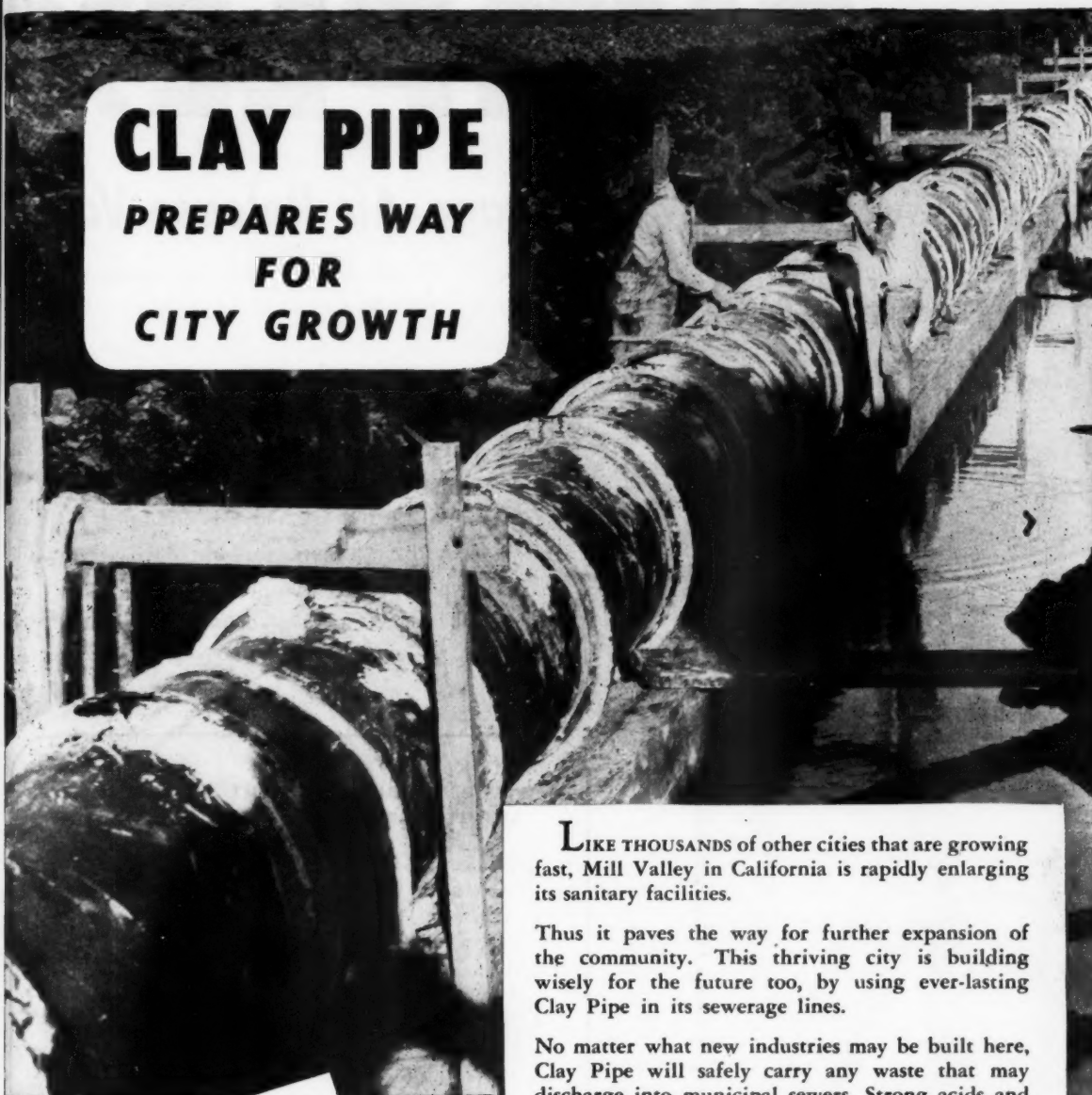


# INTERNATIONAL Trucks

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# CLAY PIPE PREPARES WAY FOR CITY GROWTH



**L**IKE THOUSANDS of other cities that are growing fast, Mill Valley in California is rapidly enlarging its sanitary facilities.

Thus it paves the way for further expansion of the community. This thriving city is building wisely for the future too, by using ever-lasting Clay Pipe in its sewerage lines.

No matter what new industries may be built here, Clay Pipe will safely carry any waste that may discharge into municipal sewers. Strong acids and alkalis cannot cause Clay Pipe to corrode or crumble. Use of this durable material is a wise and lasting investment. It is the best insurance against costly and health-endangering breakdowns.

If you need specific information on a Clay Pipe problem, write the details to the office nearest you.

3½ miles of Vitrified Clay Pipe, for large lines up to 30 inches in size as well as small lines, is being installed at Mill Valley, Calif. for a municipal sewerage line. Much of the line is below the normal water table. Depth ranges from 8 to 17 feet. Consulting engineer is John S. Bates. Contracting firm is McGuire and Hester. Robert Baumberger is City Manager of Mill Valley.

## NATIONAL CLAY PIPE MANUFACTURERS, Inc.

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# CLAY PIPE



C-547-2

# SIMPLEX

## Sewage Air Release Valve

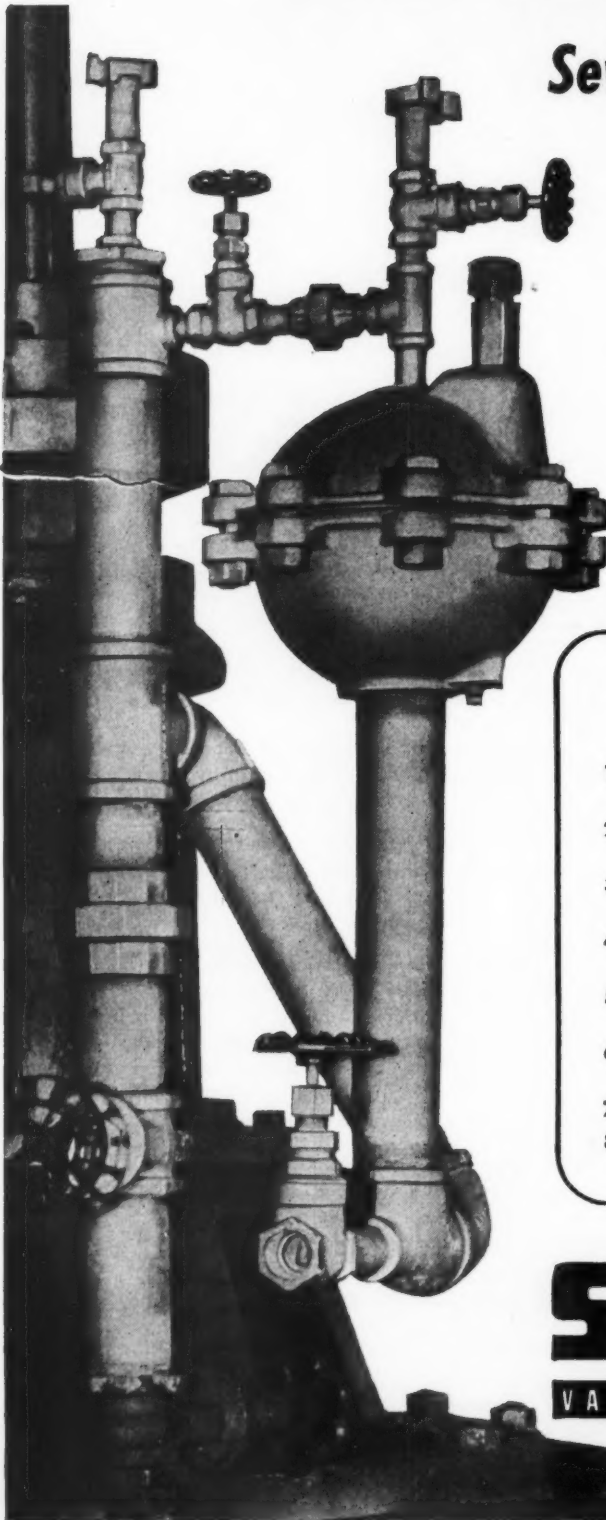
... rids air accumulations automatically and frequently from pipe lines carrying sewage or other solid matter. By virtue of its construction this type of valve can be mounted on sewer lines or on sewage pump casings. Flushing and cleaning of the internal working parts of the valve can take place at any time when Simplex's Sewage Air Release Valve is equipped with an approved type back flushing device. For full information, write: Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa. Ask for Bulletin 140.

### 8 DEPENDABLE, EFFICIENT FEATURES OF SIMPLEX SEWAGE AIR RELEASE VALVE

1. Excess power to insure opening of valve against high internal pressure.
2. A valve seat that is least liable to stick shut or leak water.
3. A non-corrodible float that will not collapse or become disconnected from its lever.
4. Simplicity of construction, easy bearings and few parts.
5. Properly designed outlet port to prevent clogging by deposits of any kind.
6. Provision for back flushing and for draining without dismantling valve.
7. Sturdy construction permitting rough handling.
8. Easy inspection of internal parts.

# SIMPLEX

VALVE AND METER COMPANY



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# The Gravity Flocculator for Water Treatment

By Gilbert R. Frith, Georgia Department of Public Health, Atlanta,  
and Lowell Cady, Wiedeman & Singleton, Engineers, Atlanta.

**Detailed information on how to design a gravity flocculator for a water treatment plant, using flash mixing and over and under baffles.**

**F**LOCCULATION has long been accepted without question, or necessity for justification, as a standard procedure in chemical precipitation of suspended matter and color from water. The basic decision of the water purification engineer is a matter of deciding between the use of a mechanical flocculator or a gravity flocculator.

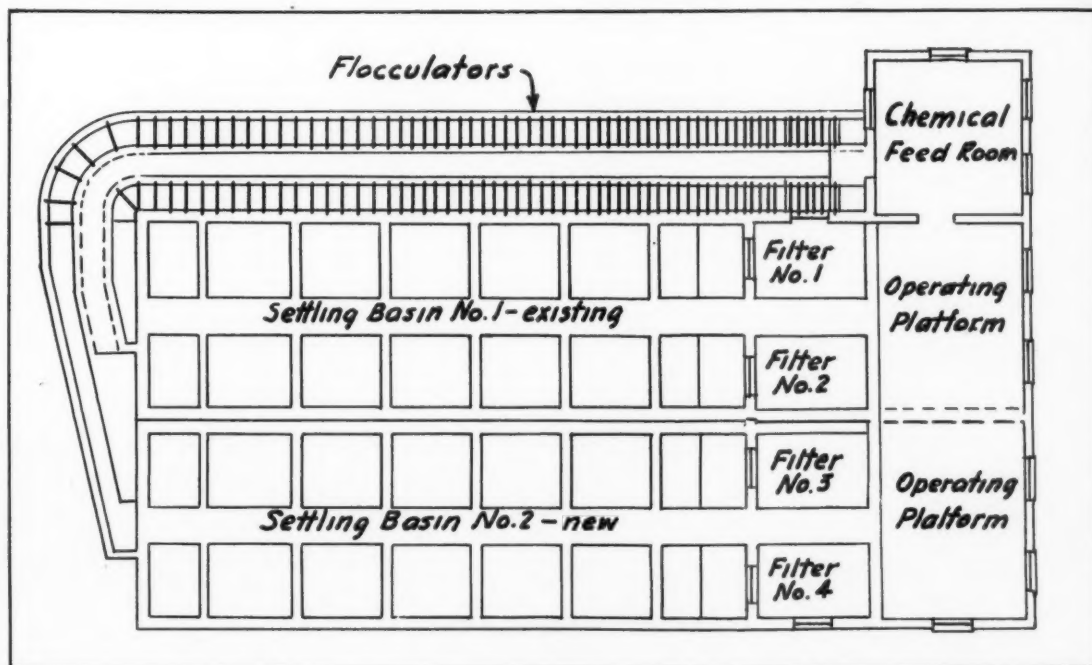
The gravity flocculator requires no special machinery, as the motivating power is obtained from about two feet of additional head on the raw water pump. The raw water pump maintenance cost will not be appreciably higher than it would be otherwise. The only other maintenance item on the gravity flocculator consists of replacement of a few top baffle boards at long intervals in the small plants where wood is generally used for baffles. The under-water baffle boards last indefinitely even when made of pine. It is only the boards that are exposed to alternate wetting and

sunlight which disintegrate, and ten years is not an unusual life even for the top boards when made of common short leaf pine. If cypress or concrete baffles are used, maintenance becomes merely a process of cleaning the flocculator periodically when the settling tank is cleaned.

Although there is no particular objection to the around-the-end baffled type gravity flocculator, the over-and-under baffled type is considered simpler to construct particularly in the small plants and is in more general use in this section.

## Length of Flocculation Period

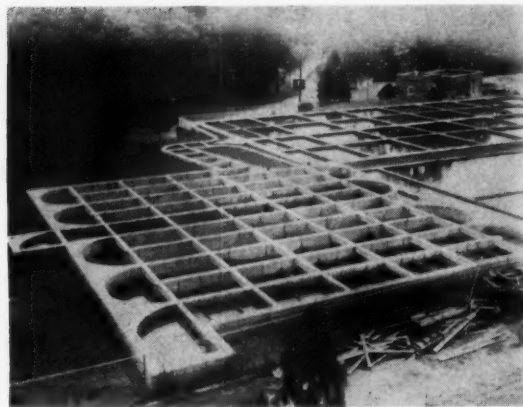
The length of the flocculation period is so closely tied up with settling time that it is necessary to give some consideration to settling tanks in this discussion. Early water plant designs included coagulation basins, providing 6 to 24 hours retention. Flocculation and



Flocculators alongside of settling basins, showing method of doubling capacity.



Flocculator at side of settling tank.



Flocculator at end of settling tank.

settling, taking place in the same basin unaided by proper velocity control, were slow and generally unsatisfactory. Later 15 minutes of flocculation, in conjunction with the old 6 to 24-hour coagulation basins, was considered adequate and did save chemicals. More recent designs have produced better results by extending the flocculation period to 30 minutes and cutting the settling time down to 4 to 6 hours in somewhat improved settling tanks.

Very considerable economy in plant construction has been effected by reduction in settling tank size. However, it is possible that considerable further improvement and economy may be effected by further increasing the flocculation time and decreasing the settling time. A long flocculation period, perhaps up to 60 minutes in some waters, produces compact floc particles of uniform size which settle rapidly. Settling periods may be cut to as little as 2 hours in future conventional settling tanks, incidentally reducing difficulties due to convection currents. However, such settling tanks will have to be properly proportioned and provided with multiple take-off weirs which have a true weir action. The so-called submerged weir and its attendant short circuiting will have to be eliminated from water works settling tanks. It is possible that water plant design can be improved by borrowing some of the settling principles used in sewage plants. However, radical departure from conventional design in the case of municipal construction is seldom wise. Radical changes must evolve slowly.

#### Functions of a Flocculator

The functions of the gravity flocculator are to: 1. Mix the chemicals rapidly and thoroughly with the

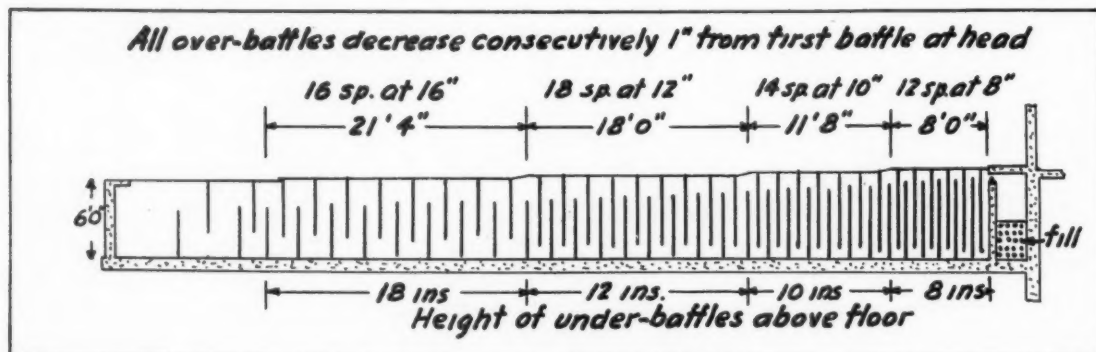
water; 2. Reduce gradually the velocity of the water so that floc particles are formed and encouraged to grow, and are not broken after formation; and, 3. Produce a rolling motion in addition to the forward velocity of the water so that floc particles become more dense and uniform in size.

The first function is accomplished by flash mixing, in which the entrance velocity of the raw water plays a part, and by the high velocity maintained in the first section. The second is accomplished by gradually reducing the velocity of the water, and by avoiding velocities higher than one-sixteenth foot per second at the point of entrance into the settling tank. The third is accomplished by wall and baffle friction, and by change of direction of flow.

There are a few general items which should be considered. The over baffles should be raised one-half inch above the flocculator floor so as to permit draining and cleaning when desired, without removing the baffles. Short circuiting due to this one-half inch space is negligible. The baffles, if of wood, should be prevented from floating by locking in place. The baffle nearest to the settling tank should always be an over baffle. In order to make it come out this way it sometimes becomes necessary to place baffles in the turns of the flocculator.

#### Design of a Flocculator

The following data are designed to give briefly the essential factors in laying out a gravity flocculator. These factors have been derived largely through long experience principally with southeastern waters. The factors have been found to work equally well on both turbid and clear waters. (Continued on page 42)



Section of flocculator, showing general and detail design.



# 2-Way Radio Expedites Traffic on San Francisco-Oakland Bay Bridge

By FRED E. EBEL

**S**PEEDY communication is a vital factor in expediting traffic on the San Francisco-Oakland Bay Bridge. The recently installed 2-way FM Motorola radiotelephone system has more than adequately demonstrated that traffic on the world's greatest bridge can be made to move more efficiently under a communication system that responds at the touch of a microphone button.

The system—installed for the public convenience, interest, and necessity—employs thirteen 2-way FM Motorola mobile units and one 30-watt FM Motorola main station.

Mobile transmitter-receiver units are mounted compactly on 4 tow trucks, 5 service cars, a fire engine, fire chief's car, electrician's car, and the traffic engineer's automobile.

## The Dispatching Installation

Daytime dispatching is done at the Toll Plaza, while during the night, the fire station on Yerba Buena Island becomes dispatching headquarters. The picturesque island serves as an excellent radio "proving" ground, inasmuch as a 540-foot-long double-deck tunnel provides the means of testing radio wave propagation "underground."

No "dead" spot has been found in this great bore, large enough for a four-story building. This is considered something of a radio feat because tunnels, with their attendant structural steel, are known to exercise a shadowing effect on most radio waves.

The ability to get into seemingly inaccessible spots is credited to the extremely high frequency employed by the bridge radio equipment. Operating on a frequency of 156,450 kilocycles—more than one-hundred times higher than the frequency of the average broadcast station—the radio waves act very much like light beams, bouncing and reflecting from tunnel walls and other structures as though guided by myriad "mirrors."

A pent-house on the roof of the Toll Plaza houses the 30-watt FM Motorola transmitter. The equipment is of modern design, incorporating radar techniques developed during the company's wartime research program. FM (frequency modulation) is employed, permitting static-free, life-like clarity of speech, vital for bridge operations where a never-ending stream of cars, diesel trucks, and interurban trains contribute to a high noise level.

A gruelling test of this noise-silencing property can be made any day on the lower level of the bridge. Here in a rectangular "cage" of steel, man-made static in the form of sparks thrown from electric trains and truck ignition systems has failed to affect the radio equipment. The clarity of the dispatcher's voice remains unimpaired, even during lightning storms.

No interference from other stations has been thus far reported. This is attributed to the absence of "skip effect." Apparently there is no sky wave at this very high frequency to "skip" or reflect from the so-called ionosphere. Behaving somewhat like light waves, these high frequency radio waves are limited to an approximate 20-mile range, more than adequate for the Bay Bridge, which measures (with approaches) 7½ miles long.

A "squellch" circuit in the receiver units is a further aid in reducing possible interference from other stations operating on the same frequency. If another station, for example, were to operate on the fringe area of the Bay Bridge transmitter, about 20 miles away, it is very unlikely that the squellch control on the bridge receivers would open to permit reception of the weak



Tremendous traffic snarls would result behind stalled cars if help could not be reached without delay.

signals. Thus the squelch performs a rough selective action, "triggering on" the receivers only when the powerful signals from the Toll Plaza transmitter go on the air.

In keeping the equipment partly "turned off" during non-transmission periods, the squelch circuit effects current economy, and, as a consequence, longer tube life.

#### **Benefits of the Installation**

Though the radio communication system has been in use only a few months, not a day, or for that matter, an hour, goes by that does not record some vital use of 2-way radiotelephone in the public convenience, interest, and necessity. Approximately 70,000 vehicles cross the bridge daily. A new high record was made on May 29th when 80,632 vehicles crossed the bridge. New records were made again on June 11, 12, 13, and on the 20th the day's traffic totaled 92,614 vehicles. This high volume of traffic results in approximately 35 daily emergencies, and on special occasions, calls have run up as high as 76 per day.

The seriousness and potential threat to safety that these emergencies present are greatly minimized through the medium of 2-way radio. About 8 cars, for example, run out of gas daily on the bridge, despite the five dollars service charge. One such car, brand new and shiny, was noticed by the traffic engineer who happened to be passing by in his radio car. He stopped, questioned the driver and learned that the motorist had been so engrossed and excited over his new car that he had forgotten to look at the gas gauge!

The traffic engineer recalled having passed Number 12 service car, and immediately radioed that vehicle's operator. The service car arrived "in practically no time at all," much to the awe and bewilderment of the motorist who thought "magic" had been performed.

Almost all of the 35 daily emergencies received at

headquarters can be classed in the minor accident category—mishaps as rear-end collisions (often resulting in locked bumpers), locked brakes, flat tires, and of course the perennial out-of-gas occurrences.

Minor as these accidents appear upon casual inspection, they can cause serious traffic congestion in as short a period as 30 seconds. Indeed 30 seconds is a relatively long time on this bridge where vehicular traffic at the rate of 7,000 cars per hour represents the usual week-day peak. Obviously, then, if service cars can be promptly dispatched to the scene of emergency, traffic can be normalized before hundreds of cars become involved in a serious traffic snarl.

Sometimes during the rush hours of 7 to 9 in the morning and 4 to 7 in the afternoon, service crews find themselves the victims of these snarls. Before the advent of 2-way radio they were forced to wait until the traffic knot untied itself, totally unaware of the cause of congestion. Now, with radio, a dispatch promptly informs them of the nature and location of the agency responsible for the tie-up. Red warning lights and siren are turned on and the service car drives against opposing traffic, seeks out the offending "bottleneck," and remedies the situation in a relatively short time.

Two-way radiotelephone was especially helpful during the evening of May 12th when a motorist informed bridge authorities of a car that had overturned. Apparently the driver had hit the ridge dividing the traffic lanes and had lost control of his car.

A service car was dispatched immediately to the scene of the accident, and upon arrival, the operator informed the dispatcher of the absence of the driver, requesting that the highway patrol be sent at once. The bridge employee then took charge of the heavy commuter traffic, directing the stream of traffic around the crashed vehicle.



2-way radio-telephone communication is unimpaired by steel structure of bridge . . .

. . . nor do sparks from nearby electrical equipment interfere with clarity of reception.



Two-way radio played a significant role in this incident. For had the operator not been able simply to push a microphone button and instantly radio his report, he would have had to make several long trips to a telephone. During this time-consuming procedure of "hunting up" a phone, the vehicle would have remained on the bridge, a constant threat to the safety of the motoring public.

As it was, a tow truck soon removed this potential hazard. It is significant to note, too, that had the driver been injured, an ambulance could have been radio-dispatched to the scene in a matter of seconds.

#### **"Get the Vehicle Moving"**

The unwritten slogan of the bridge is: Get the vehicle moving—seconds count! Some of this "seconds count" technique was demonstrated directly after the installation of the Motorola radio communication system. The operator of one of the 3 patrolling service cars observed a car with a flat tire. Having all the equipment necessary for minor emergencies—jack, compressed air, and gasoline—the repairman speedily changed tires on the vehicle and soon continued his patrolling activities. Not much later the loudspeaker in his car informed him of another flat tire at—ironically enough!—the same location he had just left.

Turning back, the service car operator was able to arrive at his previous location in a very short time. Without 2-way radio, of course, the operator would have been unaware of what had transpired behind him. Knowledge of the new flat tire would have had to come from headquarters, miles away. And then a long, time-consuming backtracking drive would have been necessary.

"Dead" mileage on the bridge is now a thing of the past. Every mile with radio is a "working" mile. For example, a tow truck en route to Oakland with a car

did not have to "double back" when the operator was informed by radio of an accident in his very destination. The driver simply dropped the tow and continued to the scene of emergency. Thus, due to speedy communication made possible by 2-way radiotelephone, a road block was cleared in 10 minutes instead of the 30 minutes estimated had radio not been present.

Operation of the equipment is practically as simple as using a conventional telephone. To talk, the operator merely pushes a button on a "military type" microphone, and speaks in a normal tone of voice. To receive, he releases the button, which actuates the receiving equipment, permitting the dispatcher or operator of another mobile unit to talk back.

Physically, it is difficult to tell that the bridge emergency vehicles are radio-equipped. This inconspicuousness is due chiefly to a small 18-inch "hat-pin" antenna which cannot be seen a few feet from the vehicle. Inside the cab, too, the only evidence of radio is the palm-size microphone and a small remote control unit. The transmitter-receiver units are mounted wherever convenient. No attempt is made to "baby" the equipment, sturdy construction permitting efficient operation over the roughest of roads.

An ever-increasing traffic load is being carried by the San Francisco-Oakland Bay Bridge, heralded on the opening day of November 12, 1936, as a monument to the engineering genius of Charles H. Purcell.

Since that time, the \$77,200,000 bridge, under the direction of G. T. McCoy, State Highway Engineer, and the immediate supervision of Howard C. Wood, Principal Bridge Engineer, has increased its initial daily average of 23,600 vehicles to the almost incredible present daily average of 70,000 vehicles.

Some of the credit for the efficient handling of this volume traffic must be given to that ultra-modern communication tool—2-way FM radiotelephone.

High frequency radio waves penetrate even the tunnel on Yerba Buena Island (left center).

When notified by radio the service truck soon reaches cars disabled on 7½ mile bridge.



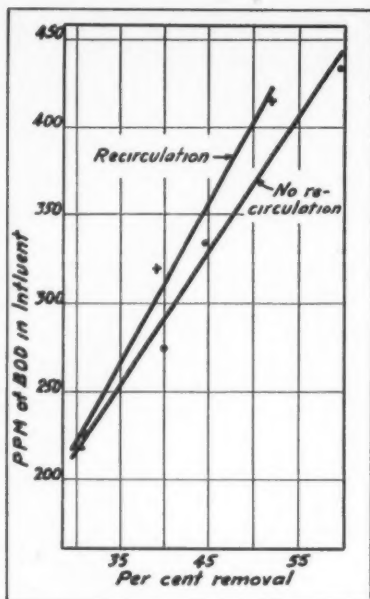


Fig. 1. BOD removal in primary clarifier, based on BOD of influent.

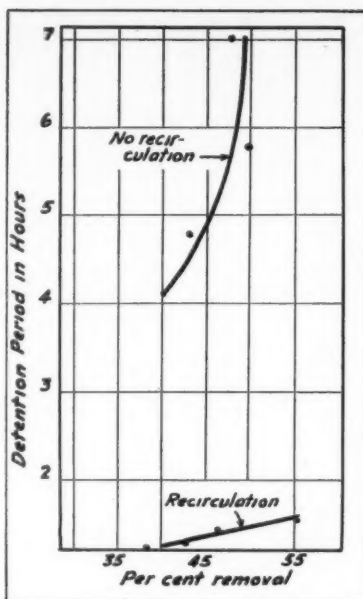


Fig. 2. BOD removal in primary clarifier, based on detention period.

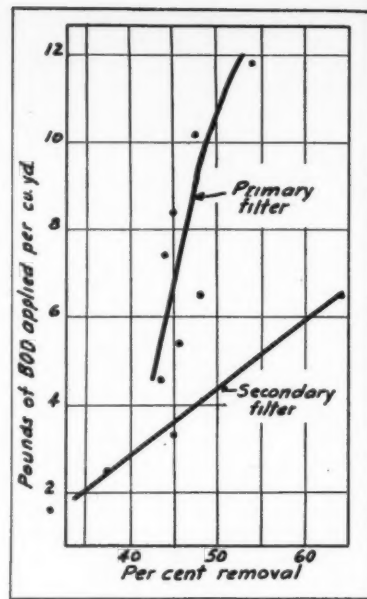


Fig. 3. Per cent of applied BOD removed by filters, summer operation.

## Observations on 2-Stage Biofilter Operation

**Primary clarifier BOD removals for detention periods of 1.20 to 7 hours;  
BOD removals in primary and secondary filters, both winter and  
summer; and in the final clarifier.**

THE Liberty, N. Y., sewage treatment plant was built in 1940 and reliable operating data have been maintained since that time. However, all analyses are based on 7-hour daytime composites, this practice being followed because the plant is normally operated on a one-shift basis by one man. The information contained in this article is intended merely as a report covering certain interesting observations on operation, and not as a basis for design. It is believed, however, that similar information from a number of plants would add materially to our knowledge of sewage treatment plant operation.

The plant is a 2-stage biofilter, which is operated as a biofilter in the summer and as a straight trickling filter in the late fall, winter and early spring. The design of the biofilter was based on a loading of 3.1 pounds of raw sewage BOD per cubic yard of filter media. Existing primary treatment tanks were used, which accounts for the short detention—about 75 minutes—during periods of recirculation. In arranging the information presented here, analyses made during the six weeks following changeover from use as a biofilter or as

a straight trickling filter were disregarded, as experience has shown that during this period the filter is in a transition stage and does not represent truly the results obtained from either process.

### BOD Removal in Primary Clarifier

Primary clarifier equipment consists of rectangular, Link-Belt equipped, settling tanks built in 1931. The detention periods vary from one hour, with the maximum raw sewage flow and 2 mgd. recirculation, to 7 hours with minimum winter flow and no recirculation. All data are based on the strength of the primary influent. In winter this consists of raw sewage, supernatant from a Dorr digester, and the secondary sludge return. In the summer, it includes in addition to the above, 2 mgd. of recirculated primary filter effluent.

Based on the strength in ppm. of BOD of the primary tank influent, which varies from 175 ppm. BOD to more than 800 ppm., Fig. 1 shows a relatively straight line removal from 62% for very strong influents—an average of all those over 450 ppm. BOD (not shown on the chart)—to 30% removal for influents averaging 215 ppm.

These figures are for the periods when recirculation was not employed. Fig. 1 also shows removal with recirculation. Primary influent, being diluted with the return from the primary filter, was weaker. Removals ranged from about 47% for influents averaging 420 ppm. BOD—the strongest group—to 27% for strengths of 170 ppm.

Removals were also calculated on the basis of detention periods, and these are shown in Fig. 2. The average detention period without recirculation was 5.9 hours and the average removal of BOD was 47.6%. The average detention period with recirculation was approximately 1.25 hrs. and the average BOD removal was 43%. The figures for removal without recirculation were obtained by averaging all analyses for flow providing 4 to 5 hours detention, those for 5 to 6 hours, etc. The same procedure was followed for periods when recirculation was used, but shorter periods of time—usually 10 minutes—were used in the computations. Since the raw sewage flow is much greater during the summer, no correlation can be obtained between these two groups of results by comparing detention periods and volume of recirculation.

Lbs. BOD applied per cubic yard

Fig.

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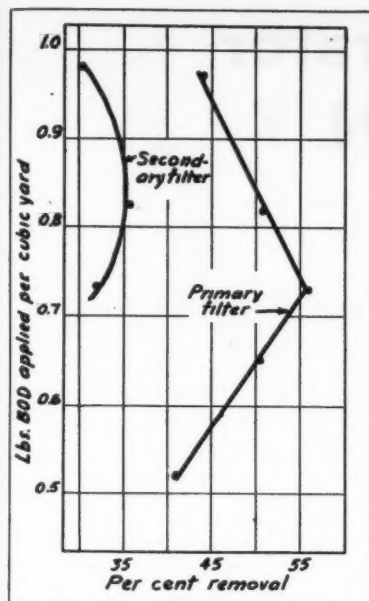


Fig. 5 Per cent BOD removed, for various loadings, winter operation.

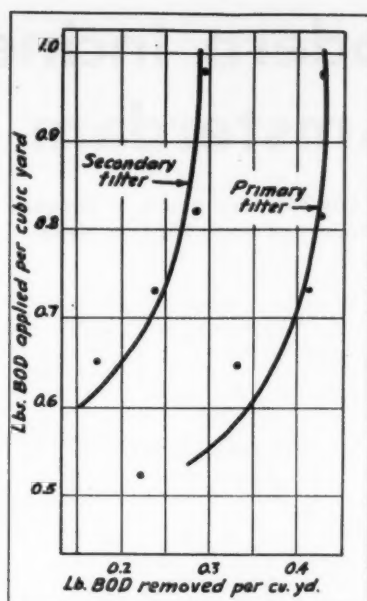


Fig. 4. BOD removed per pound applied to filters, winter operation.

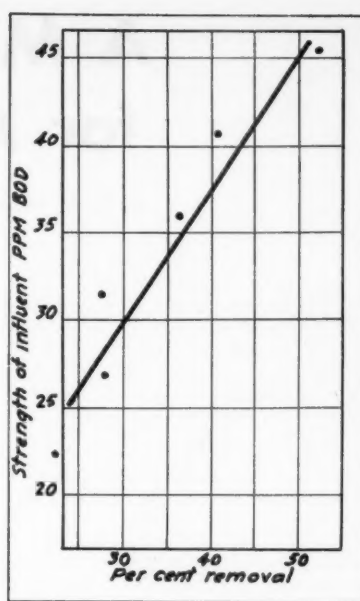


Fig. 6. Per cent BOD removal in final clarifier, summer operation.

### Filter BOD Removals With Recirculation

Removal of the BOD applied to the filters during the summer when recirculation was employed was also studied. The primary filter receives the primary settling tank effluent which, as previously stated, consists of the raw sewage, a return of 2 mgd. from the primary filter effluent, the digester supernatant, and the secondary sludge return. The analyses were segregated on the basis of the loading per cu. yd. on the primary filter. All loadings over 11 pounds of applied BOD per cubic yard of primary filter were grouped; removal with this loading averaged about 54%. The remainder of the curve in Fig. 3 was obtained by averaging all loadings and removals for the zones of loading between 10 and 11 pounds, 9 and 10 pounds, 8 and 9 pounds, etc. The practically straight line removal obtained was rather surprising. This removal varies uniformly between about 44% and 48%. Individual samples, of course, show wide variations—the 1942 results show removals as low as 21% for a loading of 4.4 pounds of BOD per cubic yard, and as high as 69% for a loading of 9.0 pounds. Rather interestingly, the results for 1941, the first full year of operation, are much poorer than for either 1942 or 1943; comparisons for later years were not plotted individually.

Loadings on, and removals in, the secondary filter are also plotted in Fig. 3. The sewage applied to the secondary filter consists of a variable amount—usually 1 mgd. or a little less—of primary filter effluent and enough secondary settling tank content to make up to 3 mgd. There were few loadings on this filter in excess of 6 pounds of BOD per cubic yard. As with the pri-

mary filter computation, heavy loadings—those in excess of 5 pounds per cu. yd.—were grouped; thereafter, groupings and averages were made of all analyses showing loadings in the ranges of 4 to 5 pounds, 3 to 4 pounds per cu. yd., etc. The curve of removal shows a very definite trend toward lower per cent removals with weaker applied sewage. With loadings between 1 and 2 pounds, removals were about 31%; for strong sewages (over 6 pounds per cubic yard) they averaged 63%.

### Winter Filter BOD Removals Without Recirculation

Perhaps the most interesting results are those shown in Figs. 4 and 5. These show removals during the winter months when the filters are employed as straight trickling filters, without recirculation. Under these conditions, the loading on the filters in terms of pounds of BOD per volume of filter media are high by any standard.

The only difference between the two filters is the size of stone. That in the primary filter is 2½-inch or larger; that in the secondary filter is 1½-inch. So far as is known, the loadings on the two filters are precisely the same. Discharge from the primary settling tank is to a siphon, and thence to the filters. Piping is the same to both filters and the distributors are the same. Both filters are at the same elevation, and both have the same underdrainage system. Results, however, are markedly different. The data given are based on analyses covering two winters, during which time analyses were made of the primary settling tank effluent and of the effluents from the two filters.

Fig. 4 shows the pounds of BOD removed per cu. yd. by the two filters on the basis of pounds of BOD applied per

cubic yard of filter media. The curves of removal are somewhat similar, but removal by the primary filter is considerably greater. The points when plotted do not make a precise curve in either case, but are about as good as may normally be expected. It will be noted that the average removal by the primary filter falls off very quickly at the lower loadings, and at around 0.5 pound per cubic yard, removal is about the same for both filters. With heavier loadings, the primary filter is decidedly superior in performance.

Fig. 4 seems to indicate that the pounds of BOD removed under these operating conditions is about the same for all loadings in excess of about 0.7 pound per cubic yard. Fig. 5 shows this is a little more graphically, and also shows the reduction in per cent removal for loadings under this range. Removal in the secondary filter is more nearly a straight-line function; however, when the curve is drawn to take in the removal at 0.82-pound loading, the secondary filter curve tends to have a form similar to the primary filter curve.

Temperatures are quite low in the winter in the Liberty area, which is in the Catskill Mountains of New York at an elevation of about 1,500 ft.

Consolidation of all samples taken during the 2-year winter period showed an average loading of 0.77 pound of BOD on the filter media. Average removal by the primary filter was 0.36 pound; and by the secondary filter 0.24 pound.

### Removals by the Secondary Clarifier

The secondary clarifier is circular, 60 ft. in diameter; it provides 3 hours detention on the basis of 1 mgd flow; (Continued on page 55)

# A Modern Incinerator for Amsterdam, N. Y.

By B. A. Kroup, City Engineer, and R. S. Taggart, Dist. San. Engr.,  
New York State Dept. of Health

INCINERATION will be the method of disposing of garbage and refuse employed hereafter by the city of Amsterdam, N. Y. The new 120-ton incinerator, constructed by the Morse Boulger Destructor Company, will replace the former open garbage dump and the small obsolete incinerator previously used for solid wastes disposal by this city of some 40,000 population (33,329 by the 1940 census).

The new municipal incinerator is the result of careful planning and promotion to meet an acute problem in waste disposal. For many years, the residents of the south section of the city have been uncomfortably aware of the presence of an open dump as periodic smoke and odor nuisances plagued them. From this extensive source of food supply and ideal breeding places, came a constant infiltration of rats, flies and mosquitoes with their attendant destructive and irritating activities. To determine the most effective means of eliminating this nuisance, the city made a study of the methods of waste disposal employed by other progressive municipalities. In this survey, it was assisted by a committee of capable citizens whose judgment commanded respect throughout the city. Their deliberations and reports were given favorable publicity by the local

press which was most helpful in building a firm base of understanding and popular support for the undertaking. As soon as the war crisis was past, the city vigorously undertook the construction of the new incinerator.

## Favorable Location Found

A plot of ground situated on the south side of the city near Cleveland Avenue, adjoining the existing dump, was selected for the site of the incinerator. This site was favorable in many respects. Being centrally located, about one mile from the heart of the business district, meant low collection costs. The slope of the hillside which dropped from an elevation of 325 ft. to 290 ft. was an asset, making possible separate levels for dumping and charging, for stoking, and for ash removal. The gravity flow through the plant reduces operating costs to a minimum. The favorable terrain lessened the first cost of the building, and the sizeable area available insured ease in truck operation at the plant.

The building housing the two furnace units is an attractive, durable brick structure with the operating facilities arranged symmetrically on either side of the stack. Entrance to the charging floor is through two doorways equipped with steel rolling doors 16 ft. wide by 16 ft.

high. To receive the refuse from the trucks, two steel hoppers 16 ft. x 16 ft., having 42 cu. yds. capacity are provided. These hoppers are counterbalanced and operate with small electric motors when being elevated for discharge to the charging openings in rear. Protecting each hopper from truck impact is a 12 in. x 12 in. bumping log across the receiving floor.

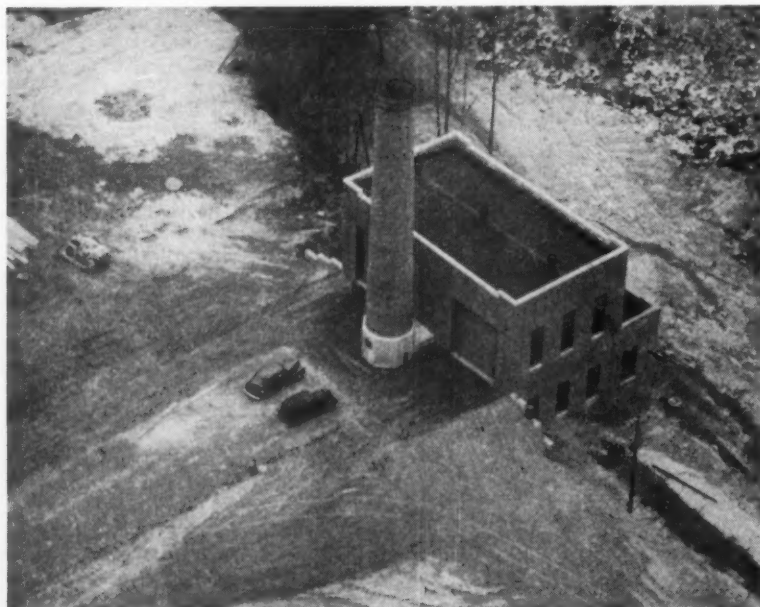
On the stoking floor, an aisle for the operators extends across the westerly side of the building furnishing access to the refractory drying hearth and grates of the ignition chamber, and to the cleanout opening in the ash pit. The main combustion chambers extend from the ignition chambers toward the stack discharging through a vertical sliding type damper into the flue. Each furnace is provided with a forced draft fan driven by a 7½ HP electric motor. The air from these fans passes through an air preheater, if desired, to assist in maintaining optimum temperatures in the combustion chambers.

The ash removal floor has two ash tunnels permitting trucks to back under the ash hoppers to be loaded with the inert residue remaining after incineration. This floor also provides office space and a locker, toilet and shower room for the convenience of the operating staff.

With an anticipated load of approximately 35 tons per day, the 120-ton incinerator is expected to burn all of the wastes during the day shift, and will provide ample capacity for future needs. Being a good neighbor, the city of Amsterdam is making arrangements for the nearby village of Hagaman, population 933, to use the incinerator and thereby eliminate another offensive open dump. Inasmuch as the residents of the city have been accustomed to mixed refuse collection for a long time, an educational program will be undertaken to familiarize them with the need for separating the ashes so the initial operation of the incinerator will not be hampered with excessive inert waste.

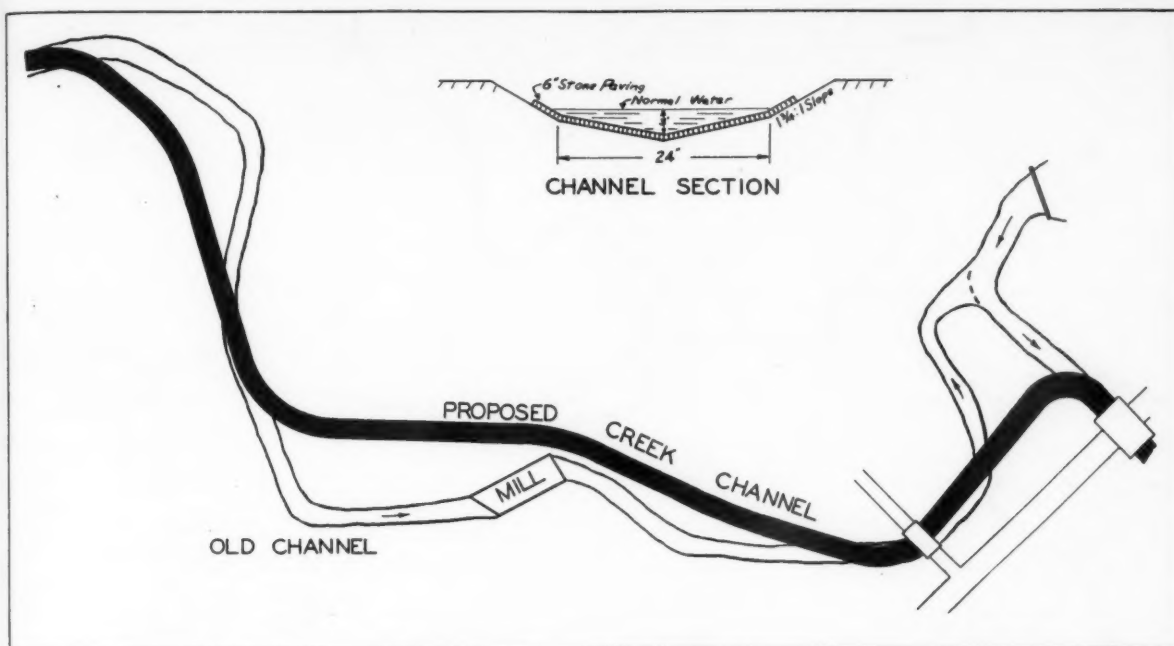
The incinerator was designed and constructed by the Morse Boulger Destructor Company under the supervision of B. A. Kroup, city engineer. The cost of the project was approximately \$260,000. The plant personnel consists of a foreman, four laborers and a watchman.

In Hagaman, the refuse is collected once a week, by contract, and hauled to the Amsterdam incinerator, where it is burned. A charge of \$4.50 is made for incinerating a 1½-ton truck-load of waste.



Courtesy Evening Recorder

View of the Amsterdam incinerator, showing favorable location on hillside.



Proposed relocation of Cayadutta Creek, and channel section.

## Flood Control for Johnstown

A comprehensive plan to eliminate flood conditions in a Mohawk Valley City; creek straightening and lining.

By A. H. McCAFFREY  
City Engineer

CAYADUTTA CREEK provides drainage for Johnstown, N. Y., which has a population of 10,600 and also for Gloversville, a neighboring city of about 22,000 population. Since 1803, when manufacturing started along Cayadutta Creek, there has been a continued encroachment on natural flow areas, and stone and concrete walls have confined the creek and created sharp turns. Today we have an irregular channel that could not be expected to drain this area as did the original creek. In addition we have gathered rain and snow waters from paved streets and roofs, and run this discharge in pipes or on the streets to the same creek. The result is that we now have bad and damaging floods.

In the case of Schrivers Pond, with Hale and Comrie Creeks as tributaries, another condition was created. This pond, which drained into Cayadutta Creek, was damned up to store water from Hale and Comrie Creeks as power and water supply for a plant located at the dam. In recent years only water is used, as electricity takes the place of water power.

Since Hale and Comrie Creeks have

been silt-bearing for the last fifty years, Schrivers Pond has naturally filled in, except for a channel through the center. Originally, when these creeks were running high, this pond could take most of the storm water in storage. In recent years the volume of space taken up by silt deposits has so increased that the storm water tops the dam, and floods

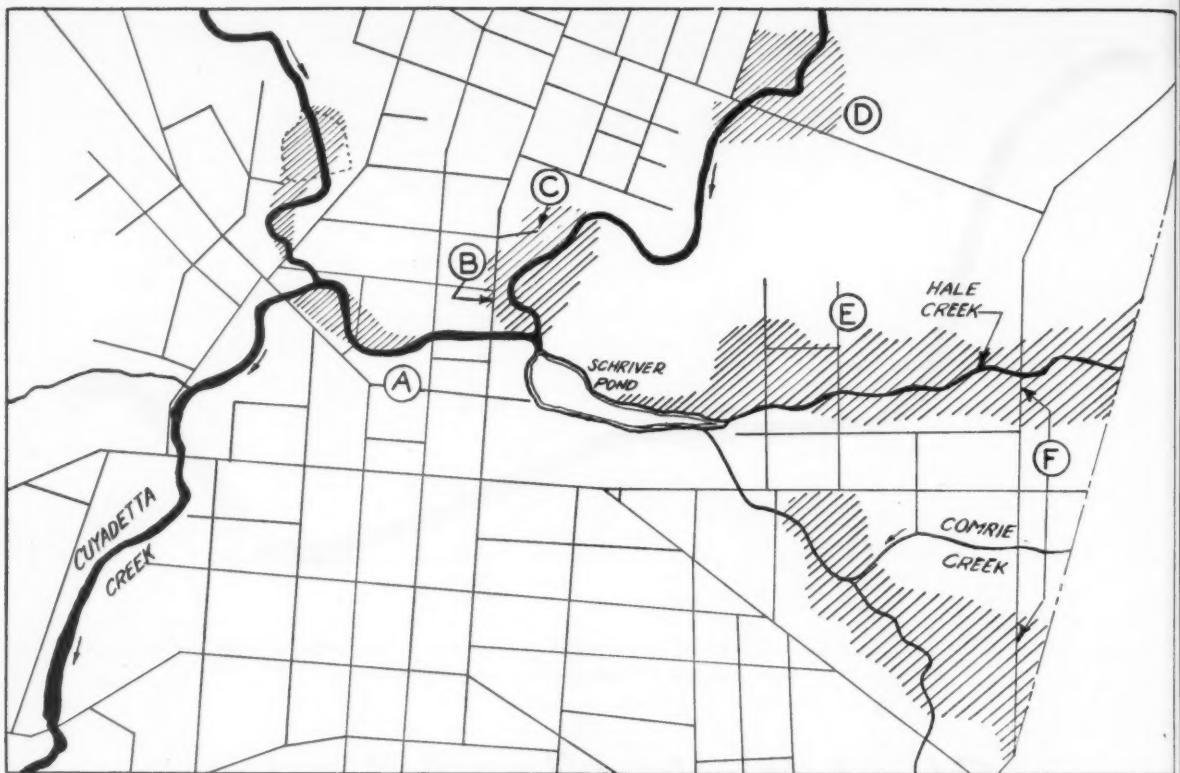
areas one-half mile up-stream, including some streets.

Every time Cayadutta Creek overflows its banks and water enters the streets, cellars of homes, factories and city sewers in the low areas are flooded, and traffic on main highways is halted. Damages are a conservative \$8,000 or more for each such major overflow.



Floods formerly caused much damage; this was the 1936 flood.





Sketch of Johnstown showing: (A) factory basement and lumber yard flooded; (B) main thoroughfare flooded; (C) factory boiler room flooded, stopping work; (D) street closed; (E) streets and cellars of residences flooded; (F) traffic on highway stopped.

### The Flood Control Program

Due to the lack of funds, we can carry out only part of the flood control program each year. Last year we removed a 27-foot section of the dam at Schriver Pond, constructed 600 feet of new channel, and cleaned and replaced creek banks along Hale Creek. By removing the dam, the mill was deprived of its water supply. By agreement with the owner, he was compensated by being furnished city water without charge. This past spring new and cleaned channels carried the water flow and the water did not back up and create a flood along Hale Creek. A tainter gate will eventually be placed at the Schriver Pond dam for water level control.

Cuyadutta Creek construction consists of cleaning the stream bed, changing alignment to produce gradual and regular curves at sharp corners, and constructing straight channels wherever possible. The construction of a straighter and smoother alignment is planned for the first 1900 feet of channel. This section of the Creek, as it now winds and turns, is about 2500 feet in length. Thus, we plan on eliminating 600 feet of Creek and by doing so, increasing its flow capacity. We will also increase the flow and the runoff by the planned paved curves and some paved straight-of-ways. The principle to be used is the same as on modern highway construction, that is, as smooth alignment as possible.

It has been found that heavy run-off appears first in Hale Creek, but in the recent past, with the dam in place, the Schriver Pond overflow topped the dam at the same time Cuyadutta Creek was taking its load. With the permanent dam out and with tainter gate control we should be able to clear Hale Creek and Comrie Creek run-off before Cuyadutta Creek receives its full load, thus reducing another bad flood condition.

It will be noted from the accompanying map that the new alignment of the Creek could have been much straighter and better but this would have caused much damage to the existing manufacturing plants.

Last year the City of Johnstown purchased from the War Assets Administration a  $\frac{1}{2}$ -yd. dragline, a 5-ton bulldozer and a 6 x 6 Army truck for use in carrying out this work. The stone for paving the new channel has been accumulated over a period of years from old cobblestone pavements, curbs, etc., which have been removed.

### Handbook of Frame Constants

Modern building codes, bridge design specifications and methods of frame analysis require proper consideration of continuity. The haunching of structural members complicates the problem of frame analysis unless tables of carry-over and stiffness factors and fixed end moments are available for a great va-

riety of members and loading conditions. This handbook contains 27,050 constants for 1,390 members, and its use will greatly facilitate the analysis of almost any indeterminate structure. Write for your copy to Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

### Construction Cost of Water Mains in St. Paul

The 1946 Annual Report of the Board of Water Commissioners of St. Paul, Minn., just received, gives data on the cost of laying water mains during the past year. One line of 4-inch, 385 ft. long, with one special and one gate, cost \$844.53, or an average of \$2.19 per ft. Fourteen lines of 6-inch, totalling 8,743 ft., cost \$22,330.25, or an average of \$2.55 per ft., of which \$1.17 was for labor and \$1.38 for material. These lines included 38 specials, 8 gates and 15 hydrants. The cost for 1979 ft. of 8-inch, two jobs, with 6 specials, 2 gates and 3 hydrants was also \$2.55 per ft. A total of 4,467 ft. of 12-inch pipe was also laid, the cost averaging \$3.93 per ft., of which \$1.86 was for labor and \$2.07 for material. These lines included 27 specials, 10 gates and 6 hydrants. In all cases, the cost of specials, gates and hydrants is included in the costs given above. In practically all cases, excavation was in clay or sand.



## Factors in the Design of

# Model Waste Treatment Plants

INFORMATION on which to design a sewage treatment plant to handle a flow of 1 gallon of sewage per minute has been requested from the Editor. The plant in question is intended to treat sewage containing a virus and is limited in size because of the amount of virus material available. The purpose of the installation is to determine if various sewage treatment processes will inactivate the virus. Information in regard to the design of this small plant, was requested from Thomas R. Camp, Harry W. Gehm and E. F. Eldridge.

Mr. Camp replied that it was impossible to duplicate, in a small plant the exact conditions that would occur in a large plant. This was due to the fact that while the flow of the liquid could be closely controlled to parallel flows found in full size tanks, the suspended particles in the liquid could not be correspondingly scaled down. He referred to his very complete article on sedimentation and the design of settling tanks in the Proceedings of the ASCE, April, 1945.

Mr. Gehm stated that "design of such units depends upon the purpose for which they are to be used," for example: Some are constructed merely to determine whether or not a process will work, laboratory equipment not being of a suitable size to conduct the experiment properly. Under other conditions, pilot plants are employed to determine the economics and "bugs" of the processes developed in the laboratory. A third use is for determining comparative efficiencies of various types of equipment.

"I believe it is obvious that in each case the design factors differ. There are, however, some general principles which we adhere to in all cases, as follows:

"1. That volumes employed be sufficient to allow accurate feeding, metering and distribution.

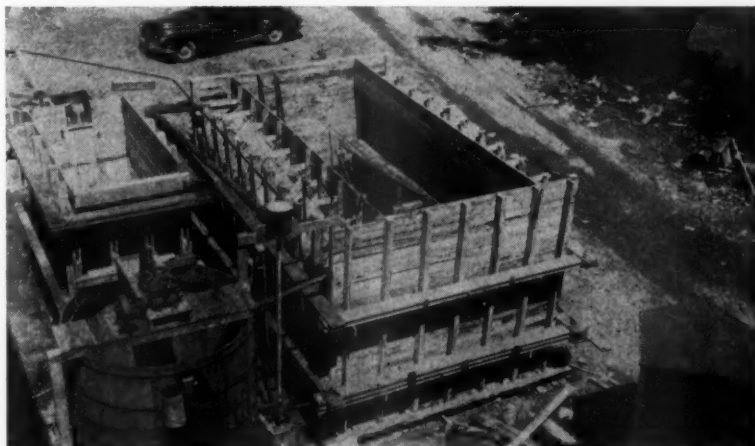
"2. That as far as possible all sources of mechanical trouble are removed by using motors, etc., of somewhat over-calculated capacity.

"3. That pipe and channel sizes and slopes be employed which will prevent clogging or settling.

"4. That every part of the plant be

readily accessible for inspection and servicing."

Mr. Eldridge said: "The use of model design or principle of similarity is governed by the use to be made of the model plant. In the case you have mentioned (the model of the Mississippi River), the considerations were largely hydraulic. There are certain laws governing the flow of water and the model should be similar hydraulically in this case. when we consider the design of a pilot plant for the study of processes, I do not feel that we must of necessity duplicate the full-scale installation hydraulically. In fact, each treatment plant is different in these con-



Courtesy H. W. Gehm

Constructing a model plant for treating de-inking wastes at Michigan Paper Co. plant.



Courtesy H. W. Gehm

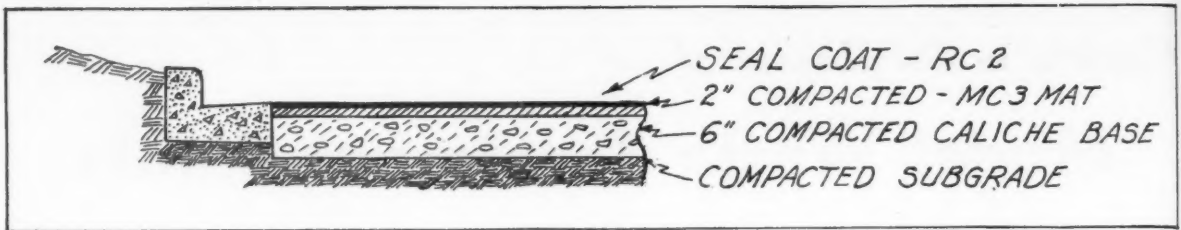
Pilot plant at Terre Haute, Ind., Paper Co., for treating strawboard wastes.

siderations. We must, of course, consider velocities of flow in pipe lines, flocculation tanks and sedimentation tanks.

"The same design characteristics should be used in the pilot plant that are used in full-scale installations. This involves the principal of similarity. For instance: Flocculation tanks, detention period 20 to 30 minutes, velocity of movement, 60 to 120 ft./min.; sedimentation tanks, detention period sufficient to allow particles of minimum selected size to reach the bottom, and dimensions to provide an overflow rate of 1500 to 2000 gals. per sq./ft./day; standard filters, depth 6 to 8 ft., rates 1 to 2 mgad; high-rate filters, depths 4 to 6 ft., loading 1 to 2 lbs. of BOD per cu. yd.; rates, 15 to 20 mgad.

"These are just a few of the design factors used in full-scale installations which must be duplicated in the pilot plant. I can see no reason for duplicat-

(Continued on page 30)



Typical cross-section of street pavement laid in Carlsbad.

## Contractor Cooperation Aids Asphalt Surfacing Program

By E. A. ROBERTS  
City Clerk, Carlsbad, N. M.

CARLSBAD has had three major paving programs, but since the last paving under these was in 1930, large parts of the town developed since then are not paved. The soil is loose and dusty, and streets used to any extent without surfacing are mudholes when it rains and dust bowls at other times. A paving program during the war and immediately after was out of the question; however a local contractor worked up a program of black topping or asphalt-mix surfacing and submitted it to property owners after receiving approval from the City Council. The Council set a standard based on the U. S. Bureau of Roads minimum requirements with curb, gutter, and surface widths specified and allowed the contractor to contact property owners and make separate contracts with them for paving or surfacing the streets adjacent to their property. The City inspected the job upon completion and if satisfactory assumed maintenance. This procedure gave a very satisfactory street surface at a nominal cost to the property owner and avoided all legal proceedings, except in the few cases where the contractor had to resort to suits to collect.

### Procedure in Construction

The contractor excavates for curb and gutter before starting the subgrade excavation. After pouring the curb and gutter his excavation of subgrade is fast and easier to shape by measuring the required depths and crowning from a string across the top of the curb, in this way eliminating cut stakes or blue tops. Excavation is 8 ins. below grade. The subgrade is then shaped and compacted. All soft and sandy areas that will not compact have caliche soil sheepfooted in, mixed with the existing soil and compacted to the same density as the surrounding area.

For the base, a 6-inch layer of pit-run caliche is hauled in. It is important that the caliche pit is rock formation and not all fines. White or light tan caliche is preferred. Large rocks are broken on

the job with sheepfoot rolling or by hand-sledging. All rock not broken to a maximum of 4 inches is discarded. The caliche is dampened and spread in layers of approximately 2 inches at a spread and the sheepfoot roller follows up, compacting each layer. The base is rolled until a minimum of 95% compaction is obtained. A tack coat of MC-3 asphaltic oil is then shot, covering the compacted base and sealing in the moisture. Oil is applied hot.

### Surface Course

The surface course material must meet the following grading requirements: The aggregate shall consist of gravel or crushed stone composed of sound, tough, durable material containing sand or other finely divided mineral material meeting the following grading requirements:

Size	Percent Passing (Sq. Opening)
1 inch	100
¾ inch	75 - 100
No. 4	40 - 75
No. 10	30 - 65
No. 40	15 - 45
No. 200	5 - 11

The material is placed and windrowed before adding the oil. For average traffic streets, MC-3 asphalt is used. For heavy traffic streets, a mixture of one part MC-3 to four parts RC-2 asphalt is used. After the specified amount of oil is shot, mixing by blading and turning is continuous until uniformity is reached. If the material is not spread the day it is mixed, or for a few days after, it is rebladed and remixed. The two-inch spread, after laying, is compacted by a 5-ton roller and by a pneumatic-tired roller to a minimum of 95% compaction.

The seal coat of RC-2 is applied in the approximate amount of 0.25 gallon per square yard. The aggregate for seal coat must be clean sand, all passing a ½ inch square opening. Rock chips are much better but more expensive. The coarser the fine sand, the better, with

not over 10% passing No. 40 square opening. From 15 to 25 pounds per square yard is spread over the hot oil. After completing a section, a flat wheel 5-ton roller is used to compact the sand into the oil and to even the grade.

This type paving has proven to be a low cost construction aid to property owners. The costs average from \$2.25 a front foot to \$2.80 depending on the width of the street, for each property owner. This does not include curb and gutter, which cost \$1.25 per lineal foot. No charge is made for intersections. A carrying charge is added if the property owner wishes to pay on a monthly basis. The City makes no collections.

The accompanying drawing shows the subgrade, base and surface in section. Street grades are set by the City to tie into the general drainage plan; and grade and construction stakes are set by the City. Curb and gutter forms are furnished by the City, thus maintaining a uniform type of construction.

### Designing Model Sewage Treatment Plants

(Continued from page 29)

ing all hydraulic factors when a process is under observation; however, the nearer we can approach the average characteristics of the full-scale plant, the better."

One of the factors to be considered must be to obtain a true and characteristic sample of the sewage to be tested. With very small flows, this will be difficult. It was suggested to our correspondent that he try out the various types of sewage samplers to determine if any of them was capable of taking truly representative samples from which the flow of 1 gpm could be made up.

Comments from our readers covering experiences with the design of pilot and model plants, and description of such plants and of results obtained with them will be welcomed by the editor.

# An Economic Study of Interior Block Parking

Off-street parking facilities are vitally needed by most of our cities. Solutions to some of the financial problems may be found in this abstract of a thesis, published by the Eno Foundation, and prepared

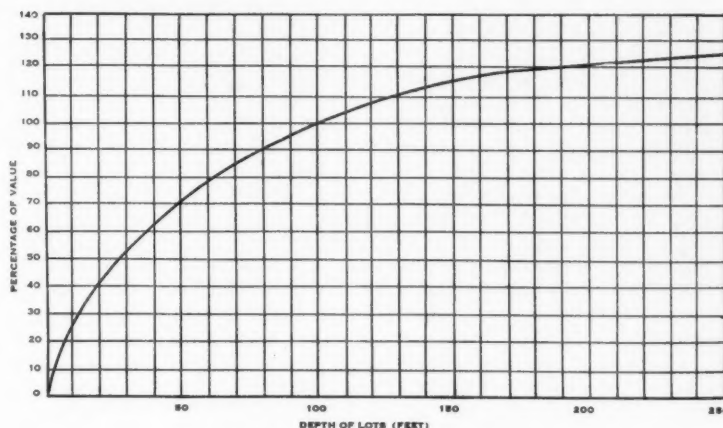
By CHARLES S. LeCRAW

A DIRECT relationship should exist between the accessibility of the individual land parcels to the street system and the comparative values of these parcels. A study was made of such comparative values of street-front and interior-block parcels within an area of not more than 2,000 ft. from the center of New Haven, Conn. Of the 15 areas studied, 12 are within 1,000 ft. of the center of the business district (the intersection of Church and Chapel Streets). Through the tax assessor's office, total values of both land and buildings were obtained for all land parcels of 15 separate city blocks. These blocks were selected because each of them contained separate "interior-block" parcels.

From the total area and improved value, the average value per square foot for each parcel was obtained. These values indicated that interior-block areas have an average value per sq. ft. about one-eleventh that of the street front areas. However, the relation is not constant; as the distance from the center of the city increases, the value of street front property decreases very rapidly. At 1,000 ft. from the center, land values in New Haven were 40% as great as at the center. The values of interior-block property also decrease. The decrease is erratic but within 1100 or 1200 ft. is in the order of 20%. The difference in values between these two types of property makes a reasonably straight curve, and varies from \$21.10 per sq. ft. at 400 ft. from the city center to \$2.76 at 1200 ft.

On the basis of 180 sq. ft. per car for parking space, the saving in land costs by the use of interior-block parking can be computed easily. The total cost per car space depends on land acquisition costs and construction costs of whatever type of facility is provided. Assuming, on the basis of pre-war figures, that the cost of open air garages amounted to \$200 (probably a low figure) land costs in excess of \$1.65 per sq. ft. for parking lots cannot be justified. The New Haven survey showed interior-block lots having this valuation or less as close as 900 ft. from the city center, and 47% of all of the interior-block lots came within this limit.

Further study of the comparative value to the city of interior-block and street front property indicated an average ratio of unit value to unit area, in interior lots, of 1 to 6. That is, the unit



The Somers depth curve of land value.

value to the city of the interior-block property is only one-sixth that of the street front property. Therefore, condemnation and city use of this property will not deprive the city of any large amount of taxes.

Studies have been made of the unit values of lots of different depths. The Somers depth curve was based on investigations and research on values in St. Paul, Minn. It indicates that approximately 70% of the value of a 100 ft. deep lot lies in the 50 ft. nearest the street. This curve of land values is shown herewith. It will be noted that an additional 15% is assigned to the third 50 ft. of depth for a 150-ft. lot.

If the Somers depth curve method is used to determine the values of the rear portions of street-front property in order to obtain additional area for interior-block parking facilities, the interior parking lots can be enlarged cheaply to house more automobiles. In most cases, the rear portions of street front property is used very inefficiently, and employment of the values indicated by the Somers depth curve makes the use of such property economically feasible. Garden City, L. I., has used this system (see PUBLIC WORKS Magazine, July 1938, article by Allan H. Rogers) and has been upheld by the courts.

## How to Use Concrete Forms

Here is a 25-page booklet that gives much practical value on the erection and maintenance of steel forms. There are instructions for the usual job, step-by-

step, from the cleaning of the footings through stripping and preparation for re-use; and information on how to cut costs and save time on the various jobs. Included are 49 pictures and sketches of the various steps in form erection. For your copy, write Irvington Form & Tank Corp., 19 Park Place, New York 7, N. Y.

## Making Your Own Rain

A new development, reported by Dr. Irving Langmuir of the General Electric Co., produces rain directly from cumulus clouds, initiating a chain reaction rainfall. Unlike the dry-ice and silver iodide methods, which produce snow first (which may turn to rain as it falls), this technique produces rain in the first place. A cloud thickness of several thousand feet, a high cloud water content, the presence of fully-grown cloud water droplets, and a vertical upward wind current of at least 5 mph. are necessary. A small quantity of water is dispensed into the cloud formation; as the drops fall, they collect smaller droplets from the cloud; and by accretion they grow. When the drops reach a size of about three-sixteenths of an inch, they begin shedding water particles, which tend to repeat the process described above. Dr. Langmuir further stated that methods have been found which will produce precipitation from almost every type of liquid cloud, but how much rain falls is dependent on the size and water content of the particular cloud.



# PUBLIC WORKS

## Engineering Methods and Data

### Water Supply and Sewage Treatment in Anderson

Virgil C. Lee, City Engineer of Anderson, Ind., has sent us the report of that city covering the period 1943 to 1947. This report covers many interesting municipal problems. One was the recent development of a new water supply by the Ranney method from the Killbuck underground basin. A separate corporation was formed which built and operates the water supply system, the city using only the water it needs at the following rates per 1,000 gallons: The first 6.5 mg., 2.2 cents; the next million gallons, 1.3 cents; and all water over 7.5 mg., 0.8 cent per 1,000 gallons. At the end of 15 years, the city will take over the supply system on payment of \$1. The accompanying sketch shows one of the four Killbuck Basin water collectors.

The sewage treatment works is of the activated sludge type and was built in 1940. Designed for a flow of 8.0 mgd., the plant is now handling much

more than originally designed for—in 1946, 36% more, but overall removal of organic matter is 94.8%. A sewer service charge of 45 cents per month on minimum water bills (more on larger bills) finances the plant and, during the past four years built up a surplus of more than \$80,000 for bond issue reduction.

### New Rochelle Uses Modern Method of Surveying

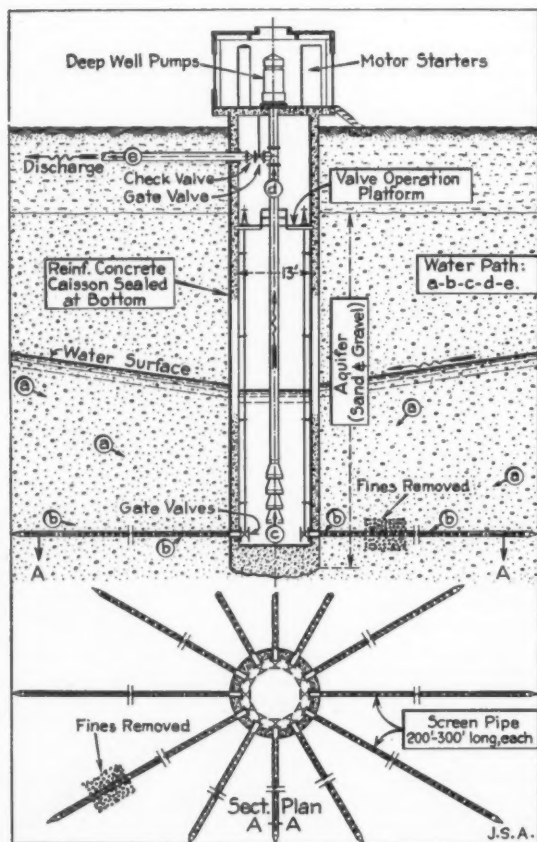
The city of New Rochelle, N. Y., has placed a contract with the Photogrammetric Division of Lockwood, Kessler & Bartlett, Inc., Engineers, Brooklyn, N. Y., to make a complete topographic or contour map of the entire city by aerial surveying or photogrammetry. This will be the first time in the east where an entire city is to be topographically surveyed by this method. It is estimated that the cost will be about 25% of the conventional ground survey method, and the time 6 months as against approximately 5 years. When the work is completed the city will have a set of topographic maps of the entire city at a scale of 200' to the inch, showing 5' contours, buildings, streets, parks, rivers, etc.; a single overall map at a scale of 600' to the inch showing 10' contours; and aerial photographs of the entire city.

### A Two-Purpose Sewage Treatment Plant

In order to care for the increased population at the University of Florida, a new sewage treatment plant has been constructed, but this new plant will double as an experimental unit. An important problem in Florida sewage treatment is the seasonal fluctuation; heavy flows are normal in the winter, and very light flows in the summer. The new treatment plant has been so designed that treatment of any multiple of 100,000 gpd., up to 700,000 gpd., is possible. This plant was recently described by David B. Lee, State Sanitary Engineer, in a paper at the Jacksonville meeting of the American Society of Civil Engineers.

### Friction Loss in Valve and Reducers

In connection with the installation of 16,000 ft. of 36-inch cast iron pipe by the city of Chicago, Ill., tests were made to determine the friction loss through a 24-inch gate valve preceded and followed by 24 x 36-inch reducers. With a flow velocity of 3.29 feet per second, the loss of head was 0.225 ft.; at 2.82 ft. per second, the loss was 0.167 ft.; and at 1.81 ft. per second, the loss was 0.071 ft. These data were part of extensive information on flow developed by the city of Chicago and published in *Cast Iron Pipe News* for October. The average indicated value for C in the Williams & Hazen formula was 140, based on these tests.



How the water in Killbuck Basin is tapped.





A snow scene in Milwaukee last winter.

Courtesy Milwaukee Journal

## "We Won't Be Caught Again"

By JOHN E. HUBEL

THAT is what Milwaukee officials in charge of snow removal from city streets say, and, to back up their claim they point to the expenditure of \$515,000 for new equipment up to the end of September. That snowstorm which visited Milwaukee, Wisc., January 29th, 1947, will never be forgotten by officials and residents; but, it is pointed out that the street cars and buses, operated by the Milwaukee Electric Railway & Transport Company were stalled for days on tracks which had been kept free from snow from time immemorial. Of course, the buses, not operating on tracks, could blame their plight on the city public works department.

However, be that as it may, here is a list of the new snow removal equipment which the city of Milwaukee has purchased up to the end of September, with more to come when delivery can be made:

- 42 blade plows
- 27 V-plows without wings
- 6 large V-plows with extension wings
- 6 tractor-mounted scoop loaders
- 3 snow suckers
- 2 bulldozers with V-plows
- 38 new trucks
- 46 new garbage trucks which can be used for snow haulage

A list of old equipment could be given, but much of this may be turned in upon delivery of the new apparatus. Of the plows ordered, many have been delivered to the city before October, with the balance being promised before the end of that month. The plows which have been delivered are being equipped with fittings so that they can be attached to the trucks owned by the city.

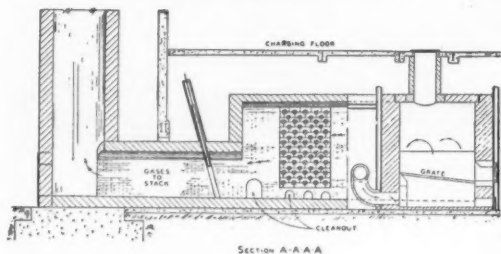
Plans are being made so that the removal of snow after a heavy storm will be handled in a new way, with primary routes and district route systems. The primary routes will include arterial highways, street car and bus lines and fire department runs. Then there will be 25 districts, each with headquarters in the district yards, but these will not conform in all cases with ward lines.

In discussing the subject, John W. Tanghe, deputy commissioner of public works for the city, said the district runs are considered secondary service, the primary runs taking care of the streets which have to stand the heaviest traffic. On the primary runs the heaviest pieces of snow handling equipment—40 of them—the largest snow plows and most powerful trucks, will do the work. "The district runs, however," Tanghe declared, "will be given service simultaneously with the primary ones, if possible. However, if any streets must wait for plowing service, they will be those included in the district runs." To get the men on the job, to man the plows, etc., it is planned to call them by telephone from the public works department or through the police department telephones.

### Parking Meters in Colorado

A survey of parking meter use and management in Colorado, which was published in *Colorado Municipalities*, shows that all three of the first-class cities in that state are now operating parking meters; and that about one-half of the second-class cities have installed them also, are trying them out for a 6-month period, or are considering their use. In some of these communities, very strong opposition has developed. Some cities have tightened regulations relating to parking time and

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have managed better enforcement. The fact remains that the cities are conscious of parking and traffic problems and are seeking some way of solving these problems. At the moment, the trend is to try out parking meters to see if they furnish a solution to all or even some of the problems.

### Fluoride Treatment of Water in Lewiston, Idaho

Fluoride treatment of the water was begun last year by Lewiston, Ida. This was the culmination of much planning and investigation by the water department over a period of about three years. It is a long term program and definite results will not be forthcoming for several years. It is felt by all in the department that it is a very progressive step and one that has the support of the State Health Department and the dental profession.

Sodium fluoride is used as the source of fluorides and is being fed with a Wallace & Tiernan Novadel feeder. The sodium fluoride runs about forty-three per cent fluoride ion and it requires about twenty pounds per million gallons to give the desired 1 ppm content of fluoride. It is very easy material to feed. Sodium fluoride at the present time is about eleven cents per pound and the treatment costs about two to three tenths of a cent per one thousand gallons of water. There is very little loss of fluoride ion in the purification process.

Public reaction to this new service will no doubt largely depend upon the attitude of the dental profession, and since the prominent dentists who have been interviewed have been highly in favor of it, it should prove to be very acceptable to the public. It is to be expected that there will be the usual number of reactionaries that are opposed to anything that is new.

Fluoride treatment requires good laboratory facilities for adequate control and should not be attempted by plant or water departments that are not so equipped. The method of fluoride determination given in the new "Standard Methods" will be used for control here. There are at least two substances present in water which interfere to some extent with the accuracy of this test. Correction must be made for these interfering substances.

Fluoride treatment is designed to prevent tooth decay in children; some statistics indicate a reduction of 60% to 75%. Lewiston is believed to be the first city west of the "Rockies" to initiate such treatment.

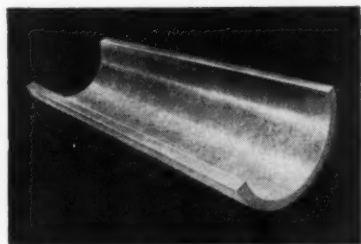
### Creosoted Wood Piling Used in Kansas Dam

Construction of a dam to provide a water surface to attract flights of wild ducks and geese was recently completed by the Kansas Forestry, Fish and Game Commission in the Republic County State Park, a flat basin in the Republican River Valley, near Jamestown. A total water surface area of 765 acres is impounded by the new dam when its reservoir is filled to capacity. Since the volume of water retained is not greatly in excess of 1,000 acre-feet, it is obvious the lake is quite shallow and the impounded water may entirely evaporate during extended periods of summertime dry weather or drought. It is anticipated that the usual autumn rainfall will replenish and maintain the reservoir to provide for shooting during open season at the time of the annual fall flights southward.

The dam is of reinforced concrete of the low-water type, with a stem extending 6 ft. above the base. A copper water stop is embedded in the construction joint

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on a highly polished steel mandrel, accounts for the high flow coefficient of Transite Pressure Pipe—C-140, based on the Williams and Hazen formula.

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benefits of the favorable fire insurance rates which result from a modern, efficient water distribution system of ample capacity.

Another advantage—the engineer may design his water system with pipe of minimum diameter, rather than resort to larger pipe than would otherwise be necessary in order to offset the progressive reduction in flow caused by tuberculation. This practice is not necessary when Transite Pressure Pipe is specified.

And, of course, since tuberculation is not a problem, the costly expense otherwise involved in cleaning and lining of water mains can be eliminated.

A maintained high-carrying capacity is one of many advantages of Transite—the modern asbestos-cement pipe that was engineered to carry water more efficiently and more economically. For further facts, write for Brochure TR-11A. Address Johns-Manville, Box 290, New York 16, New York.



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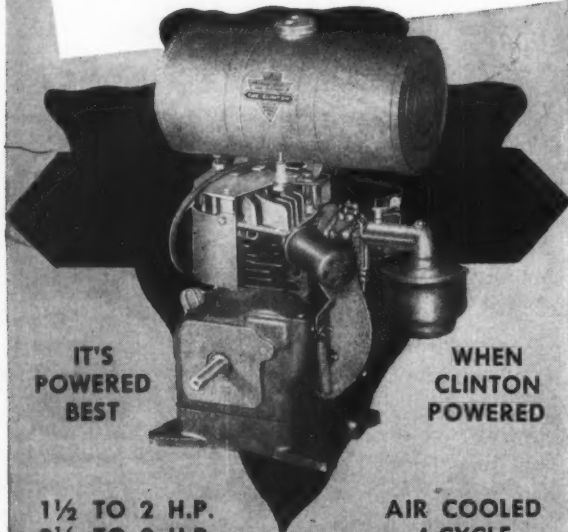
Accurate Pitometer tests conducted in the field verify Transite's maintained carrying capacity of C-140.





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between the base and the stem. The spillway is about 200 ft. in length. Three rows of wood piles were driven for the support of the dam. The upstream row under the stem was set on a batter of 1¼ to 1 to resist thrust, and the other two rows were installed vertically. These piles were 25 to 30 ft. long and were driven with a McKiernan-Terry 9B3 steam hammer. The formation under the dam is principally mud and silt. By reason of the intermittent character of the water supply and the consequent fluctuations in ground water level here, the wood piles were pressure creosoted with a final retention of 12 lbs. of preservative per cubic foot of wood. The dam was designed and built by Wilson & Co., Consulting Engineers, Salina, Kans., with B. L. Richardson as resident engineer. *Wood Preserving News.*

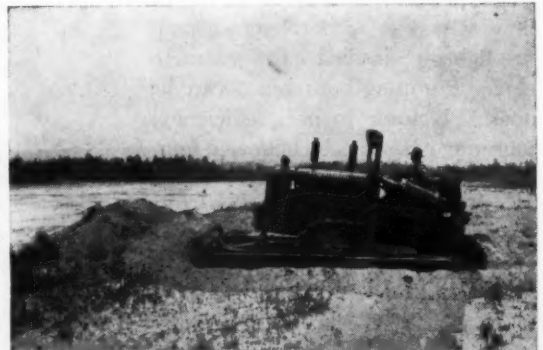
### Working a Riverbed to Increase Well Water Supply

The Orange County, Calif., Water District, by working down vegetation in the bed of the Santa Ana river, leveling off the riverbed, and loosening the topsoil, permits greater amounts of water to be retained in the riverbed when water is flowing. Thus more water sinks into the ground water storage basin and more is available for pumping to neighboring cities. The wells are 900 feet deep. The tractor, an International diesel crawler, is regularly worked on an 8-mile stretch of the riverbed; it is shown herewith at work 5 miles from Orange, California.

To facilitate the spread of water evenly over the entire riverbed and prevent the cutting of narrow channels, five 1000-ft. long stabilizing dams have been built at ¼-mile intervals across the entire channel of the river in the pumping area. "Each stabilizer," says Dion L. Gardner, secretary of the Orange County Water District, "is built of rolled and tamped clay and protected with a covering of black-top asphalt, and is placed across the flood channel. Packed clay extends 3 feet below the surface and is approximately 8 feet wide at the top. The entire structure is one inch below the bed of the river. It is invisible most of the time, being concealed by river sand. The primary purpose of a 'stabilizer' is to spread the low flow of the river over the full width of the channel and thus stabilize the river and prevent channels being cut. It is by such means that the maximum percolation and recharge in the forebay or intake area of the water basin of Orange County is obtained."

The tractor is used for the following purposes: (1) In stabilizer construction, for digging trenches, exca-

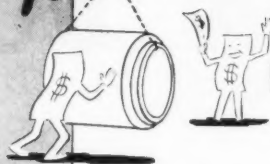
(Continued on page 40)



IHC Tractor working riverbed to increase well water yield.



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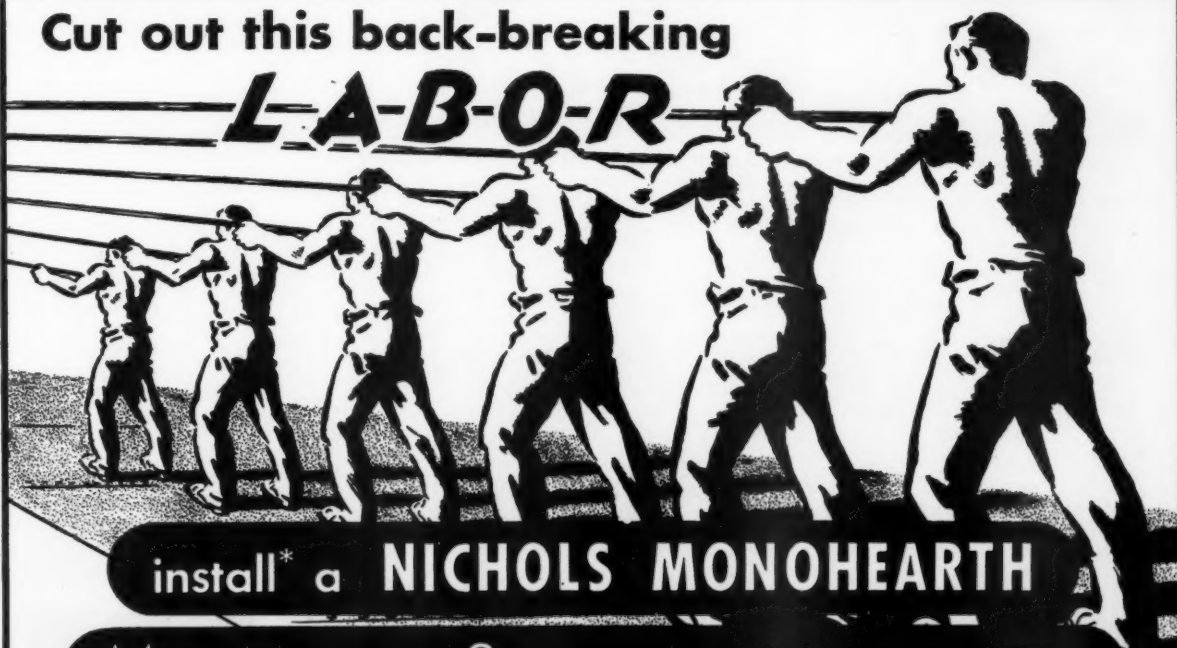
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# HOW TO USE A BULLDOZER

## CLEARING BRUSH AND SMALL TREES

RATE: 1 1/2 MPH



## CLEARING MEDIUM TREES - 4 TO 10 INCHES

RATE: 1 TO 3  
MINUTES PER TREE



1. RAISE BLADE AND PUSH TREE OVER

2. BACK UP, DROP BLADE, LIFT ROOTS FREE

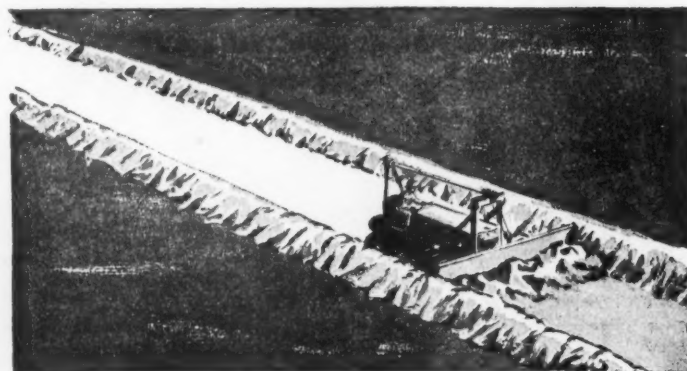
Courtesy OCE, WD, USA

Here are some of the ways that bulldozers can be used in the every-day tasks of the contractor, the city or county engineer or the superintendent of Public Works. The amount of work that can be done depends on the size of the equipment used—the tractor and the bulldozer blade. Even a small unit will operate well on clearing brush and in handling small trees; for cutting ditches that are not too large; and for undercutting large trees. A larger outfit is required for heavy dirt-moving operations, especially where the dirt has to be handled for any considerable distance.

A 90-hp. tractor and the proper size bulldozer for it will move about 70 cu. yds. per hour on a 100-ft. haul, and approximately proportional amounts up to 250 ft. A 30-hp. tractor and appropriate bulldozer equipment will move about 30% as much as the larger unit. Use downhill or on the level, slot-dozing as shown herewith. Adjustable blades may add to the efficiency of the work, permitting the blade to be angled or tilted as necessary.

Below: Method of removing large rocks and boulders.

## SLOT-DOZING



1 BLADE IN STRAIGHT POSITION

2 WORK IN EXACTLY THE SAME TRACKS

3 SPILLAGE FORMS WINDROWS ON EACH SIDE WHICH RETAIN MATERIAL IN FRONT OF BOWL

Courtesy OCE, WD, USA



STEP ONE

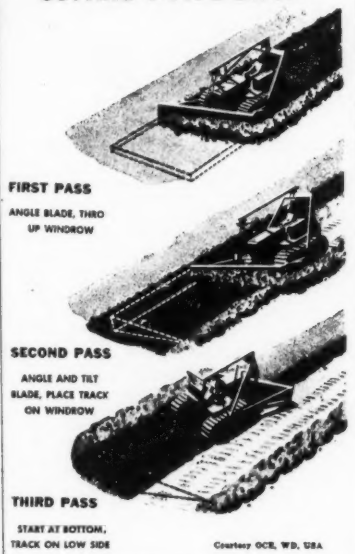
DIG AROUND ROCK

WORK C  
ROCK  
MOIST D  
WARD,  
ORWA

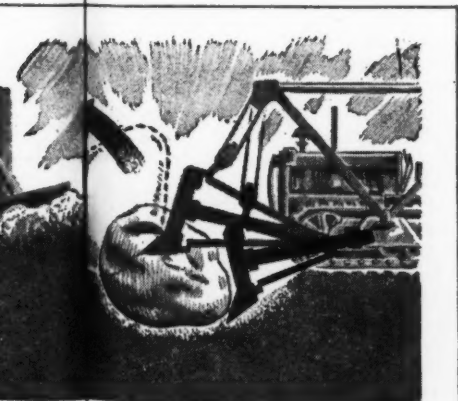
# DOZER

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## CUTTING V-TYPE DITCH



Above: Side casting method of ditch excavation removes approximately 60 cu. yd. per hour.

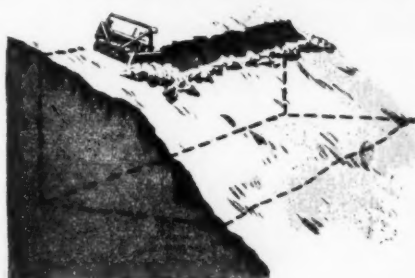


### STEP TWO

WORK ONE CORNER OF BLADE UNDER ROCK  
MOIST DOZER BOWL AND TRAVEL FORWARD, LIFTING OUT ROCK WITH A FORWARD ROLLING MOTION

Courtesy OCE, WD, USA

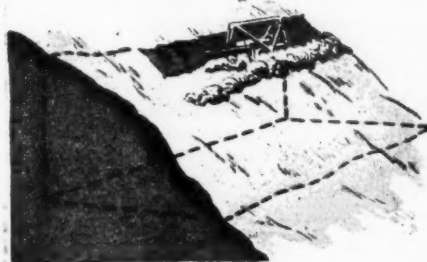
## METHOD OF OPENING SIDEHILL CUT



### TO OPEN CUT

- 1 APPROACH FROM TOP WITH BLADE STRAIGHT
- 2 CUT BENCH, PUSHING DIRT DOWN THE SLOPE
- 3 CONTINUE UNTIL BENCH IS LONG ENOUGH FOR OPERATION AS SHOWN BELOW.

## METHOD OF SIDEHILL EXCAVATION



### TO EXCAVATE

- 1 ANGLE BLADE FOR SIDE-CASTING
- 2 LOWER INSIDE CORNER OF BLADE
- 3 DOZER WORKS PARALLEL TO SLOPE
- 4 USE CUT-AND-SWING METHOD ON BENCH WIDER THAN BLADE

RATE: APPROX CU YD PER HOUR OF EXCAVATION (SIDE-CASTING 100% EFFICIENCY) D8 ANGLEDZER = 180 CU YD AN HR D7 ANGLEDZER = 170 CU YD AN HR

Courtesy OCE, WD, USA

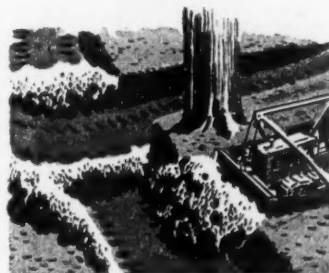
## CLEARING

### LARGE TREE REMOVAL -12 TO 30 INCHES

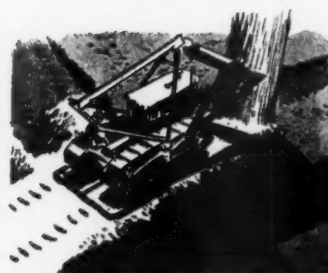


CUT ROOTS ON SIDE ONE TREE TO BE PUSHED FROM HERE

CUT SIDE TWO



CUT SIDE THREE



BUILD RAMP ON SIDE ONE AND PUSH TREE OVER

Courtesy OCE, WD, USA

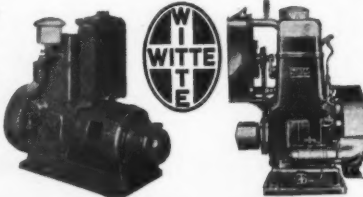


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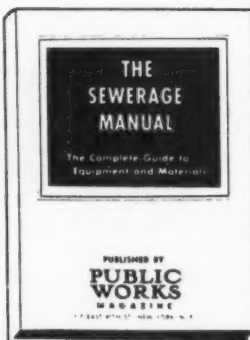
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vating, building access roads, etc.; (2) To pull a single-gang disk harrow, which breaks up the surface clay so that it may be removed by the flowing water; and also to inhibit weed growth; (3) To level the river bottom either by pulling a 'land leveler' tool or by building ridges or channels to help the river water spread over the entire channel width and thus increase the wetted area, with greater resulting absorption; (4) To construct spreading basins in the channel; (5) To pull a ridger which is new and experimental. This ridger is 24 feet wide in front and is pulled by two TD-18 tractors. The idea is to ridge the channel and pull clay, which deposits in the top 6 inches of sand into long windrows or ridges which, it is hoped, will be removed by flood water. These various procedures should increase the absorptive capacity of the channel and aid the water spread. Later, Mr. Gardner may experiment with a 'rooter' to break the underlying clay seams and thus facilitate penetration.

## Sand Drainage Wells Save Money on Connecticut Highway

During the past summer, Connecticut used sand drainage wells on a relocation of Route US 1 at Old Lyme. The wells, nearly 400 in number, were installed by a department boring crew. The auger-jet device consists of a 25 foot length of two and one-half inch pipe with four steel fins and curved steel cutters welded to its lower end. The wells were 12 inches in diameter and extended practically to the bottom of the marsh muck which was 25 to 30 feet deep. The wells were spaced 15 feet on centers transversely and longitudinally. Over 500 cubic yds. of clean sand were needed to backfill the wells. A suitable sand bank was located and the sand hauled and distributed along the center line so as to form a roadway over which successive trucks could travel.

The boring crew used a homemade timber derrick on skids, on which were mounted an engine and winch. A pump for supplying jet water was installed on the river bank. Each well was dug by working the auger-jet into the marsh muck. As each one was excavated and the muck washed out, sand was taken in wheelbarrows from the sand roadway and dumped into the well. Since the wells were backfilled immediately after being excavated, the holes did not cave in. This eliminated the need for casing pipe and greatly speeded the work. After a small amount of experimenting the work progressed rapidly and as many as 25 wells a day were installed.

Another detail consisted of having the road contractor lay two longitudinal lines of six inch perforated corrugated metal pipe on the marsh surface prior to commencing the fill. These pipes were provided with outlets by cross drains extending to the toe of the slope. The perforated pipe served to carry away the water squeezed up through the drainage wells into the bottom three-foot layer of clean selected fill. Possibly the pipe could have been omitted, but it did prevent the fill layer from becoming completely saturated during construction.

The efficiency of the wells is indicated by the behavior of the 20 settlement plates placed on the marsh surface prior to placing the fill. While the fill was being placed, settlements increased at the rate of about seven inches a week. In six weeks the fill (15 to 20 feet high) was completed and settlements then averaged three and one-half feet. Immediately on completion of the filling the rate of settlement dropped to

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only two inches a week and it is anticipated that all settlement, except perhaps for two or three additional inches, has taken place. This means that permanent pavement can be placed next year. Had the wells been omitted, settlement would have taken 15 to 20 times longer. Furthermore, slides which probably would have occurred, did not do so.

Excavating all of the muck and replacing it with good borrow would have cost approximately \$100,000. If only the top five feet had been excavated, the cost would have been about \$25,000. In addition, settlement would have been nearly 3 ft. and would have required several years for completion. Displacing the muck by overloading and blasting would also have been expensive and probably would have given uneven settlements, due to pockets of muck not removed.

The use of sand drainage wells at the Old Lyme location was suggested by calculations for settlement, stability against sliding, etc., made by Philip Keene, department soils engineer, after an analysis of tests of muck samples made at the Portland Laboratory.—From Cuts and Fills via Highway Research Abstracts.

### Determining Various Chlorine Compounds in Water

A procedure which makes it possible to determine quantitatively the amount of free chlorine, chloramine, chlorine dioxide and sodium chlorite in water containing a mixture of these constituents was described by Dr. John F. Haller and S. S. Listek of the Mathieson Alkali Works at a recent meeting of the American Chemical Society. The method consists of four amperometric titrations with sodium arsenite from which the concentration of each component may be derived. Free chlorine is determined by titration of a sample from which chlorine dioxide has been removed by hydrolysis at an alkaline pH. A second titration in the presence of iodide gives the combined concentration of chlorine and chloramine. A third titration in neutral solution gives the combined concentration of chlorine, chloramine and one-fifth of the chlorine dioxide. After acid hydrolysis, a fourth titration in neutral solution gives the total oxidizing capacity, thus permitting calculation of the chlorine content.

### Training Course in Concrete Construction

The Portland Cement Association has established a training course in the fundamentals of concrete making and concrete construction practices. This will be conducted in 13-week courses, and is designed to accomplish a dual purpose. It will be limited to personnel of the Association and its member companies, and is a part of a greatly expanded research, development and educational program intended to improve still further the quality of construction using portland cement and to effect economies in time and use of materials. The work will be under the direction of John A. Ruhling, manager, Technical Personnel Training, 33 West Grand Ave., Chicago, Ill.

### A Practical Use for Puppy Love

Much publicity was given, some years ago, to the use of an alligator for getting a rope through a sewer in order to drag a cleaning device through it. There are no trained alligators in Ohio, so engineers at Milford tied a line to the collar of a Beagle, put her at one end of a 200 ft. length of 10" pipe and one of her puppies at the other end, and she pushed her way through with dogged determination.

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## Motion Picture Films of Road Construction

A catalog of motion picture films covering road construction and maintenance and allied subjects has been prepared by John A. Focht, Chairman of the Visual Education Committee of the ARBA. This lists something like 100 films, some sound and some silent. It is believed that information regarding the use, as well as a copy of the catalog, can be obtained from C. M. Upham, American Road Builders' Ass'n, 1319 F St., NW, Washington, D. C. Most of the films appear to be 16 mm, but some are 35 mm. Many of these films would be of great value in an on-the-job training program.

## Rates for Private Facilities at an Airport

The following rates were in effect during the past season at the Lewiston-Nez Perce County airport: 2 cents per square foot per year for hangar space; 2 cents per gallon on all gasoline delivered (this apparently does not apply to CAB licensed air lines); \$1.00 per square foot per year for Administration Building space. The above information is contained in the Lewiston, Idaho, annual report; W. P. Hughes is city engineer.

## Mechanical Street Cleaning Saves Money

Lewiston, Idaho, reports that about seven miles of downtown streets are swept daily with a "Guttersnipe" sweeper. This work was previously done by two men with a truck. The cost with the machine is much less. In 1945, with hand sweeping, the cost per mile of streets cleaned was \$3.18, whereas in 1947, using the mechanical sweeper, the cost per mile was \$1.73. About 25% more mileage of streets cleaned cost about two-thirds as much.

## The Gravity Flocculator

(Continued from page 20)

**Classification of Flocculators by Size.**—For the purposes of this article, the following size classification will be followed: (1) Small flocculators, 0.1 to 0.75 Mgd.; (2) medium small, 0.75 to 2.0 Mgd.; (3) medium large, 2.0 to 4.0 Mgd.; (4) large, 4.0 to 10.0 Mgd.; (5) very large, 10.0 Mgd. and larger.

**Flash Mixers.**—a. For small flocculators, the influent pipe to the flocculator; b. for medium small and medium large sizes, 15 to 20 seconds retention; c. for large and very large flocculators, special treatment is required.

**Design Flows for Flocculators.**—For sizes (1), (2) and (3) (see above), design flow should be 50% more than normal flow; for sizes (4) and (5), design flow should be from 50% to 25% more than the normal flow, with the very large units designed for 25%.

**Velocities.**—For sizes (1) and (2), divide the flocculator into three sections. In the first section, velocity will be 1.5 feet per second; in the second section, 0.5 feet per second; and in the third section 0.125 ft. per second. For sizes (3) and (4), divide the flocculator into four sections. In the first section, velocity should be 1.5 ft. per second; in the second section, 0.75 to 0.55 ft./sec.; in the third section, 0.33 to 0.25 ft./sec.; and in the fourth section 0.125 to 0.10 ft./sec. Special treatment is generally required for the sizes represented by (5), that is, the very large units.

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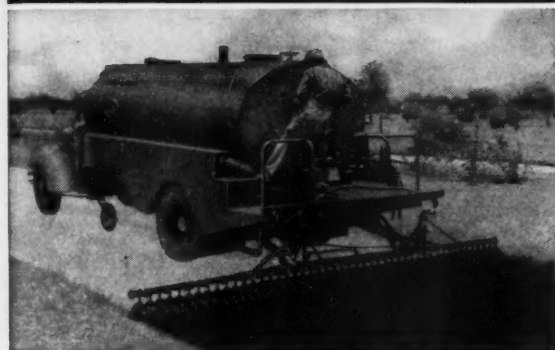
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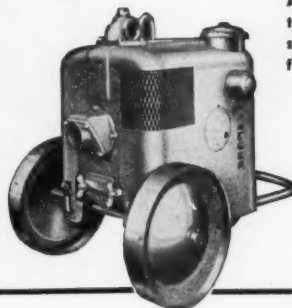


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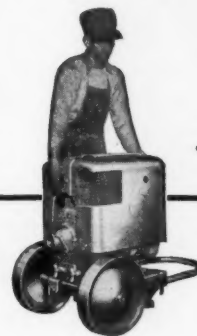


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alongside of the settling tanks in single or multiple flumes for sizes (1) to (4), inclusive. b. Constructed at the ends of the settling tanks for sizes (2) to (4), inclusive. c. Constructed for size (5) as a separate flocculator with suitable flocced water conduits large enough to insure that the floc will not be broken up (water velocity not greater than 1/16 ft./sec.).

**Baffles.**—a. Over and under baffles are required for sizes (1) to (4), inclusive; special treatment is required for size (5).

**Drop in Over-Baffles.**—a. The first baffle is set to have sufficient freeboard, using the standard submerged weir formula. b. Each succeeding baffle is generally dropped 2 ins. or treated as a special case for the size under consideration.

**Under-Baffles.**—a. Opening below the first under-baffle is designed as an orifice to produce a theoretical velocity not greater than the velocity used in computing of baffles in the first section. b. Each succeeding under-baffle is raised 1 in. to 2 ins., depending on the design flow and the developed profile of the flocculator. The top of each over-baffle must overlap the bottom of the adjacent under-baffles at least 6 ins.

**Baffle Spacing.**—In general, spacing of baffles in feet is derived from the formula  $S = Q \div CWV$ , where S is spacing of the baffles in feet; Q is design flow in cubic feet per second; W is the selected width of flocculator, generally 2 ft. to 6 ft. for sizes (1) to (4); V is selected velocity in feet; and C is a coefficient, determined by test, or assumed, in general, at 0.60 to 0.75, depending on the size of the flocculator.

**Turns.**—Turns used in separate type flocculators should have a radius equal to the width of the passage plus one-half the thickness of the walls.

**Loss of Head.**—The loss of head will be 6 ins. to 12 ins. from the flash mixer to the entrance to the flocculator, and 18 ins. through the flocculator.

**Retention Time.**—a. Flash mixers should be figured at 15 to 20 seconds retention at the maximum filter plant capacity anticipated in 15 to 20 years, so as to retain a central chemical feed room, with no split feed, when the plant is expanded. Mixers should be filled by bricking or otherwise to provide 15 to 20 seconds retention for initial design. Units for large plants will require special consideration. b. Flocculators should have not less than 30 minutes retention at 25% overload. The type and temperature of the water are important considerations.

### Treating De-Inking Wastes

The National Council for Stream Improvement reports that encouraging results are being obtained in treating de-inking waste in a 30,000-gallon pilot plant located at the Michigan Paper Company's mill at Plainwell, Michigan. Removals of BOD in excess of 70 per cent have been obtained consistently at loadings in excess of those obtained in laboratory tests of the aeration process employed. Excellent dewatering of the primary sludge is obtained due to the fact that the short sedimentation period employed prior to aeration produces a sludge relatively higher in fiber than filler residues. The problems remaining to be solved by this installation are (1) the provision of air diffusion equipment which will not require frequent cleaning and (2) a method for improving the dewatering qualities of sludge produced by the aeration process. The work is being done under the direction of Philip F. Morgan, resident engineer, Kalamazoo.



# PUBLIC WORKS DIGESTS

## Sewerage

## Water Supply

## Highways and Airports

*This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of the principal articles, in which the articles in each periodical are numbered consecutively throughout the year, beginning with our January issue.*

The letter and number at the end of each item refer to those used in the Bibliography. Numbers not found in the current Bibliography will be found in the one published the previous month.

# The Water Works Digest

## Characteristics of Synthetic Siliceous Zeolites

Operating exchange capacity, salt economy and life expectancy are the three most important characteristics of a base exchange material used for water softening. Ion exchangers include natural greensand, processed greensand, bentonitic clay, synthetic gel-type mineral, carbonaceous exchangers and the newer synthetic exchangers. Only the first four at strictly zeolites and included in this investigation; which was conducted by the Metropolitan Water Dist. of Southern California, which has an investment of over \$100,000 in zeolite alone for use in the largest zeolite water softening plant in the world.

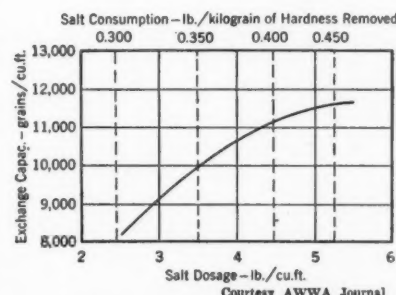
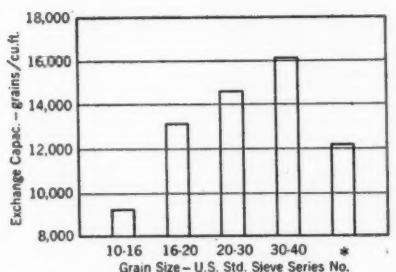
The results of this investigation are given in detail in this paper, and are summarized as follows:

The operating exchange capacity of a synthetic siliceous zeolite is influenced by the chemical composition, grain size and porosity of the mineral; by the depth of zeolite in the softener unit and the rate of softening; by the degree of exhaustion to which the bed is run; by the quality of the water being softened; and by the salt dosage and regeneration procedures used. Of particular importance to the exchange capacity of a zeolite is the salt dosage.

Life expectancy of zeolites is a function of the chemical and physical characteristics of the different minerals and of water quality, particularly silica content and temperature. Although control over water temperature is usually not feasible, silica content can be increased, pH can be adjusted, and soluble and insoluble impurities can be controlled to prolong zeolite life.

One of several revivification processes may help to restore to an old zeolite some of the operating exchange capacity lost after prolonged use.

Proper control of brine concentration



Effect of salt dosage on salt consumption and exchange capacity.

and contact time between brine and zeolite during regeneration is essential if optimum exchange capacity and salt economy in zeolite operation are to be attained.

Of particular value is the effect of grain size on exchange capacity, and of salt dosage on salt consumption.<sup>A140</sup>

## Sterilizing Jute-Packed Mains

The use of only thoroughly pre-sterilized packings and the exercise of care to keep all soil, clay and other contaminants out of the pipe as it is being laid greatly reduce the hazard of

a contaminated main. If these precautions are taken, a final treatment with chlorine will generally give satisfactory results. But such final treatment may be unsuccessful if the pipe is seriously contaminated. It is believed that, if this is the case, alkali-activated quaternary ammonium compounds can be used to great advantage. These are more expensive than chlorine compounds, but the expense may be justified. Their success can be attributed to high germicidal power plus surface-active and detergent properties which enable them to wet out fibers of jute or other packing material quickly and effectively, and to remove dirt, nutrients and debris if these are present. "Klerol" (an organic mercury compound containing 2.128% mercury, made by Reilly Tar & Chemical Co.) gave a successful treatment in the laboratory when used at a concentration giving 3 mg of mercury per grain of hemp; while chlorine-liberating compounds failed when used at available chlorine levels as high as 800 ppm.<sup>A131</sup>

## Main Extensions

A number of members of the Society have prepared a panel statement of their ideas concerning equitable rules for the financing and installing of water mains to supply new customers, and a form of contract to be made between the water utility and each customer who asks for an extension to his property. In general, the policy should be to adopt rules which do not favor new customers so greatly that extensions to mains will increase, or tend to increase, the cost of water service to existing customers. New customers, however, should be able to obtain main extensions and water service at the lowest reasonable cost. Generally, revenue from a new customer should exceed the cost of supplying

water, including the carrying charges on the plant, general property and the large mains used in serving him. The utility's investment in a main extension to serve a new customer should be based on the portion of the revenue available to cover carrying charges on such an investment.<sup>A132</sup>

### Studies of Watershed Runoff

The U. S. Forest Service is studying watershed runoff on a large-scale experimental project in the Nantahala National Forest, where 28 small independent drainage areas have been selected for testing. On two of these all tree and shrub vegetation was cut back to the

ground, and the run-off increased 65% the following year, and 100% during the period of low flow. On one stream, all trees on land less than 15 ft. above the stream bed were cut and allowed to lie as they fall, and the base flow of the stream increased 20%. Clearing a steep forested shed and planting it to corn made little difference in infiltration for 2 yrs.; but with the third year, erosion, storm runoff and peak discharges increased. Heavy grazing on a grassed area reduced the storage capacity of the soil during storm periods. Future studies will include the effect of forest fires on water yield and quality; the amount of water used by different kinds of vegetation; the effect of logging and soil cul-

tivation on game fish production; and the effect on stream temperatures and water quality caused by cutting stream bank vegetation.<sup>P32</sup>

### Problems in Cathodic Protection

In use in this country are over 500,000 miles of cast-iron water and gas mains. Protection of these from corrosion by cathodic methods has become more or less widespread during the past 15 years. Its advantages are to some extent offset by the disadvantages that it may, under some conditions, cause or increase corrosion in structures located near the one protected. This imposes an obligation on the user of the process to protect adjacent structures, and on the owners of those structures to inform the user so that protective measures can be properly planned and carried out. A "Correlating Committee on Cathodic Protection" has been formed, with the A.W.W.A. one of the 11 participating members, the objective of which is to assist operators in solving this inter-industry problem by the issuance of informative bulletins.<sup>A133</sup>

### Radio Service

Radio service can be secured by a water utility either on a subscription basis from a common carrier, or under an ownership-sharing or facilities-rental agreement, or as the owner of an independent system. Telephone companies offer two types of service, under both of which they will furnish, install and maintain all radio equipment required; the "common-carrier" type is similar to a party line and is not recommended; the other type, which is recommended for water utilities, is a completely independent system furnished on a rental basis. Of the two kinds of radio, amplitude modulation and frequency modulation, the latter is preferable for water departments. Of one-way, two-way or three-way transmission service, the two-way is recommended. Cost of an installation varies with its size. That for Seattle costs about \$16,000 for the master station and seven fixed auxiliary stations, and the 42 mobile units cost \$550 apiece; and operation and maintenance in 1946 cost \$1,485.80.<sup>A135</sup>

### Slime in Water Mains

Growths of Crenothrix, fresh water sponges and other types of organisms occur in many water mains, whether of iron, steel or concrete, and such growth has been known to reduce the flow by as much as 30%. This can generally be prevented by continuous use of chlorine or other chemical, but this is expensive and may be otherwise objectionable. It may be satisfactory to use chemical treatment periodically. In some cases copper sulfate has been effective, but not if the alkalinity of the water is high. In open conduits, sunlight may tender chlorine ineffective. Other chemicals, such as the chlorinated hydrocarbons, should be used with caution be-



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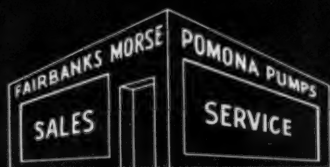
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cause of tastes and odors and possible toxicity. Where the pipe line is of uniform size and without obstructions, a large rubber ball covered with chains and inflated, and carried through the pipe line by the force of the water, has given very satisfactory results. In some cases steel brooms have been pulled through.<sup>A136</sup>

### Chemical Fixation of Oxygen

A plant of the Dow Chemical Co. at Pittsburg, Calif., uses river water in its heat exchange equipment at the rate of 1.4 mgd. This water is substantially saturated with air to yield 8 to 10 ppm of dissolved oxygen, which caused such

serious tuberculation as to require replacement of tubes every 18 to 24 months. Equipment for vacuum de-aeration would be expensive, and a method was developed whereby the oxygen was removed by the addition of sodium sulfite at the rate of 0.67 lb. per 1,000 gal. The reaction was extremely slow until cobalt was added as a catalyst, when the reaction was complete in 15 to 20 seconds, causing complete de-oxygenation. Only 0.001 ppm of cobalt was required. Operation for a period of 18 mos. has resulted in a substantially complete elimination of corrosion. This chemical treatment is more expensive to operate than vacuum de-aeration, but the cost of plant for the latter is much

more expensive. It is now proposed to install a plant for vacuum de-aeration to reduce the dissolved oxygen to 0.6 ppm, and completely remove the remainder by chemical fixation.<sup>A138</sup>

### Selection of Sampling Points

The U. S. P. H. drinking water standards specify that "The bacteriological examination of water... shall be of samples collected at representative points throughout the distribution system." The author suggests some principles for selecting such points. For small plants, the system can be divided into a series of zones, giving each zone approximately the same population. If there are two or more sources of supply, zones should be arranged to enclose areas served by an individual source or by a single group of sources. More than ordinary attention should be paid to sections having cross-connections with privately owned supplies and to water-front areas, and samples taken frequently. Where the distribution system is zoned for pressure purposes, sampling of each such zone should be provided for. If there are reservoirs or tanks in the system, samples should be taken from a connection directly below each of them. As to sampling points, variable rather than fixed sampling points should be chosen, samples being taken from ordinary faucets, preferably in business premises and public buildings.<sup>A139</sup>

### Testing Joints In Welded Mains

In laying 36" welded steel pipe in Portland, Ore., the contractor devised a method of testing the tightness of each joint as soon as it had been welded. The joints were bell and spigot with a fairly tight fit, welded both inside and out. A 1/2" tapped hole had been made in each bell in the shop. Air at the specified test pressure (50 psi above operating pressure, but not less than 125 psi) was forced through this hole into the space between the bell and spigot and between the two welds, and the outside of the joint was painted with soapy water to detect escape of air. As sections about 700 ft. long were completed, they were tested hydrostatically and showed that there was not a single leak in the welding.<sup>A137</sup>

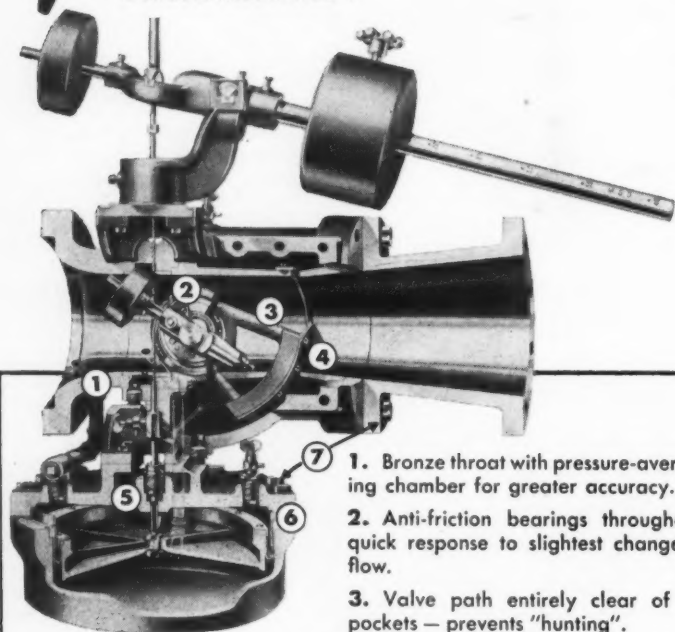
### A 10-MG Steel Reservoir

The Washington Suburban Sanitary Com. completed recently what is probably the largest steel reservoir in the United States, 292 ft. in diameter and 21 ft. high. Steel was chosen, as compared to reinforced concrete, on the basis of economy and insurance against leakage. The cost was \$243,000. It was erected in ten weeks in spite of some delays in receipt of materials. The steel work was furnished by Chicago Bridge & Iron Co.

The floor of 1/4" plates was placed on a leveled clay subgrade surfaced with 2" of sand, provided with drainage to keep it dry; while possibility of corro-

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sion was further reduced by pickling the steel by the phosphoric acid process. At joints, the bottom plates were lapped  $1\frac{1}{4}$ " and welded. Side walls consisted of three rings of 7 ft. plates, 1", 0.65" and 0.30" thick, respectively, all joints butt-welded. The roof was of  $3/16$ " plates supported on 141 steel columns arranged in 7 consecutive circles and resting on the steel bottom plates.<sup>E27</sup>

### Chlorine Dioxide At Weirton, W. Va.

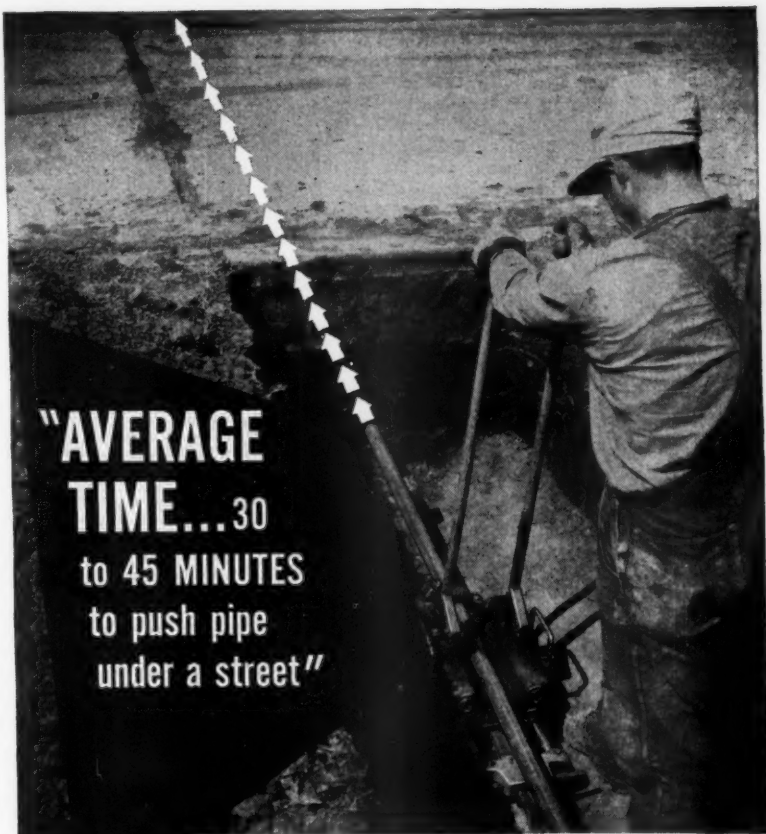
Weirton, W. Va., population 14,300 tried potassium permanganate, activated carbon, chloramine, and breakpoint chlorination to remove taste and odor from the Ohio river water, but none were fully satisfactory. In October 1945 they began trying chlorine dioxide, and since January 1946 have been using it continuously. With more simplicity in handling and slightly lower chemical cost they are delivering water with less taste and odor than any of the other processes had furnished. After chlorination, coagulation and sedimentation, 1 ppm of chlorine dioxide is added and the water stored for 80 min., then sand filtered; than 0.5 ppm of chlorine dioxide is added in the clear well. The pre-filter dose of chlorine dioxide throws out the manganese which the river water carries; and the split treatment affords two opportunities to check tastes and odors.<sup>F81</sup>

### Revamping the Little Falls Filters

At Little Falls, N. J., were built the first rapid sand filters in rectangular beds, in 1902. The filters, installed by the New York Continental Jewel Co., were 24 x 15 ft., with an underdrain system of cast-iron header and laterals provided with brass strainers. Both water and air wash were provided. The filter sand has been removed, cleaned and resized several times. About four years ago it was found that some of the underdrains were plugged with sand and scale, and the entire underdrain system has recently been replaced with Leopold glazed tile underdrains, the air wash system removed, and anthraflit substituted for the sand and also for the supporting gravel.<sup>F83</sup>

### Selecting Diesel Engines

Select an engine with a comfortable margin in rating over the peak hp to be carried. Present-day limits for heavy-duty stationary engines call for continuous ratings to be based on 80 lb. BMEP for non-supercharged 4-cycle engines, 120 lb. for supercharged 4-cycle engines, and 65 lb. for 2-cycle engines of the pump scavenger type. The present practice is to allow 1400 ft. per min. piston speed for 4-cycle engines and 1000 ft. for 2-cycle. Cooling systems should always be of the indirect type—a double circuit system in which one circuit consists of the engine cooling water which is circulated constantly, preferably using a heat exchanger of the shell and tube type.



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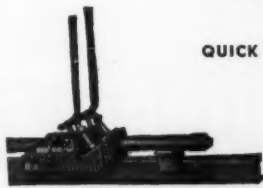
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Among the late developments is the application of supercharging to 4-cycle engines—supplying the cylinder with fresh air at a pressure higher than atmospheric. Supercharging may be by means of a mechanically driven blower, or by turbocharging, in which the kinetic energy of the exhaust impulses is used to drive a vaned runner in a casing with a centrifugal air compressor on the same shaft. Turbocharging increases the useful work 40 to 50% for the same bore, stroke, number of cylinders and rpm, whereby the fuel consumption is materially reduced. It automatically adjusts the amount of air delivered in accordance with the load on the engine. If it is known that the engine load will be increased in one or two years, an unsupercharged engine can be purchased, and supercharging added when its capacity is reached.<sup>643</sup>

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136. Control of Slime Growths in Transmission Lines. By Ray L. Derby. Pp. 1107-1114.
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138. Chemical Fixation of Oxygen. By David J. Pye. Pp. 1121-1127.
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42. Fluorine Determination in Water Using an Electrophotometer. By A. R. Todd. P. 369.
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30. Water-Borne Disease Outbreaks. Pp. 24-25.

31. Hearne's Municipal Utilities Show a Profit. By Norman L. McCarver. Pp. 29-30.
32. Experimental Studies on Watershed Run-off. Pp. 34-35.
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#### X La Technique de L'Eau October

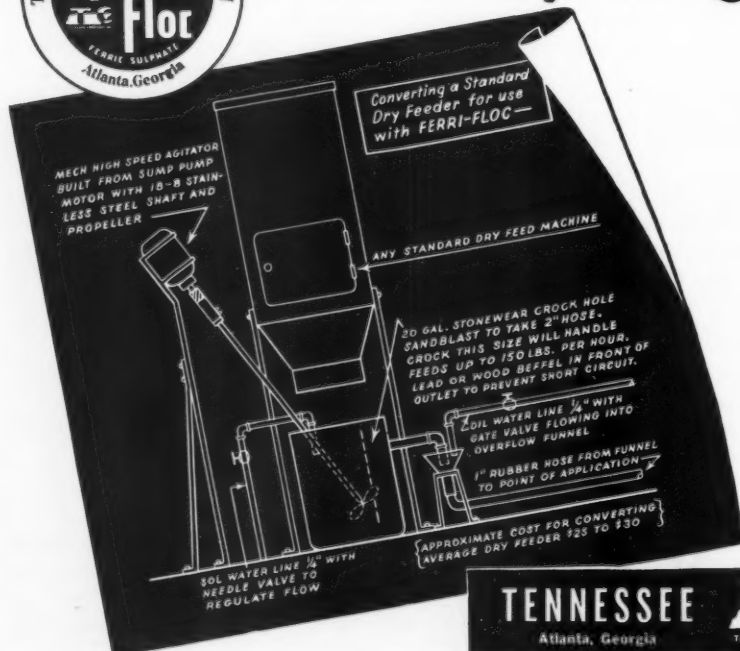
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*Ground Water—Its Development, Uses and Conservation.* By E. W. Ben-nison and W. M. Bollenbach. Edward E. Johnson, Inc., St. Paul, Minn. 509 pp., well illustrated. Price \$2.25.

This is an excellent and authoritative book. It consists principally of a series of articles which appeared in the Johnson National Drillers' Journal between March, 1940, and July, 1946. There are 16 chapters, including: Origin of Ground Water; Water Bearing Rocks; The Water Table; Ground Water Provinces; Prospecting and Testing; Construction of Wells; Drilling Machines and Well Records; Hydraulics of Wells; Well Screens; Development of Wells; Gravel Treatment; Sanitation, Well Contracts and Well Troubles; Testing for Yield; Pumping Equipment; Power Units and Pump Testing; Impurities and Treatment of Well Water; and Use and Conservation of Ground Water. There is no index, but an excellent table of contents.



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### Price Trends in Highway Construction

Data have been issued by the Public Roads Administration covering highway construction costs for the third quarter of 1947. These show that common excavation averaged 40 cents per cubic yard as compared to an average for 1946 of 36¢; concrete pavement \$3.26 per sq. yd., as compared to \$2.78 average for 1946; reinforcing steel \$0.093 per lb., up from \$0.075 average for 1946; structural concrete, \$46.14 per cubic yard, up from the 1946 average of \$38.79. Early 1946 costs were materially lower, and the increase for the third quarter over the second quarter of 1947 is not very great. The major portion of the rise occurred during the fourth quarter of 1946, though there has been a tendency, in most work, for a continuous increase since the middle of last year.

### Water Works Publications

*Pipeline Construction* outlines and describes many of the pipeline laying jobs now underway, and it may give you valuable information on clearing, rock removal, trench excavation and the other problems likely to be encountered. Form 10606, Caterpillar Tractor Co., Peoria 8, Ill.

*Self-Priming Pumps*, automatic, are available in five sizes, 1½x1½ to 4x4 and this bulletin describes them in a simple and effective manner with the aid of flow diagrams and charts. Bulletin O8B6319B (if you can copy it correctly), Allis-Chalmers Mfg. Co., Milwaukee 1, Wisc.

*Stopping Rot* is the general subject of a 4-page folder which covers in some detail the protection against decay and mildew of wood, rope, and canvas. Rockford Paint Mfg. Co., Rockford, Ill.

*Steel Pipe for Strong Chemicals.* A plastic lining for steel pipe has been developed which permits the handling of strong chemicals without damage to the pipe. A plastic tube is formed and inserted in and bonded to the steel pipe. More information from Amercoat Division, PO Box 3428, Terminal Annex, Los Angeles 54, Calif.

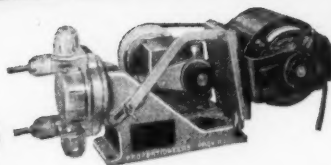
*Electronic pH Meter.* This line-operated pH meter is described in 7 pages of small type which cannot readily be abstracted here. Ask for Bulletin 110, Photovolt Corp., 95 Madison Ave., New York 16, N. Y., and you will get a lot of instructive and valuable information.

*Valves.* Bleeder line protecting valves for turbines are described in this excellent 24-page bulletin, which explains mechanism details and operation in an unusually simple manner. Bulletin 8-K, Schutte & Koerting Co., Philadelphia 22, Pa.

*A Dictionary of Concrete Forms* is contained in the new catalog of the Irvington Tank & Form Corp., 19 Park Place, New York 7, N. Y., which describes Atlas Speed Forms. Important points relating to wall, floor and foundation forms for poured concrete are grouped into subjects and arranged in alphabetical order. Sent on request.

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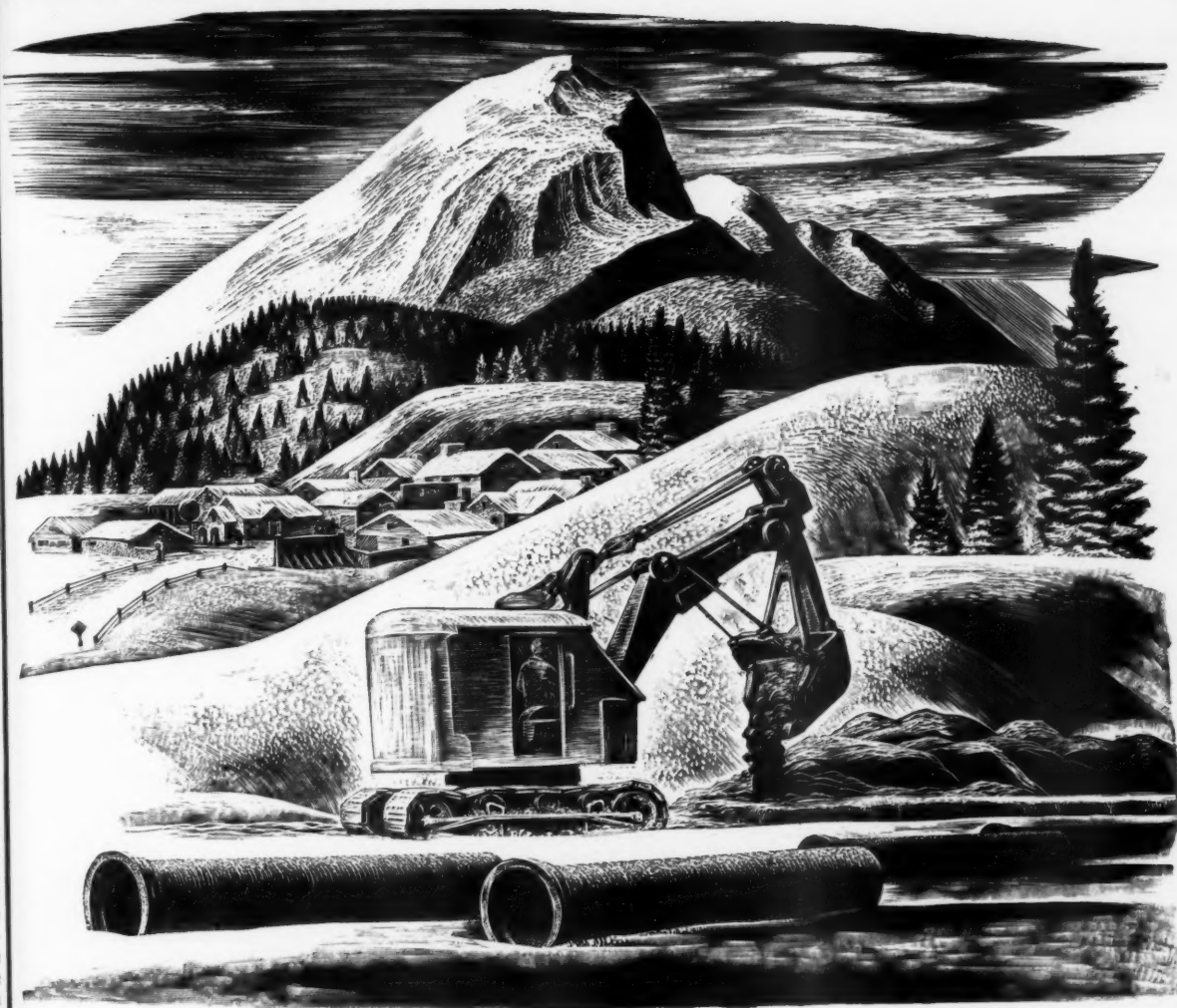
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means of a circular metal skirt placed within the tank near the outside wall and extending from above the liquid surface to within a short distance of the bottom of the tank. The Brownwood tank, a primary clarifier, reduced the B.O.D. from 1862 lb. to 1219 lb.; the total suspended solids from 2066 lb. to 1161 lb.; and the volatile suspended solids from 1498 lb. to 969 lb. The Greens Bayou tank, which serves as a final clarifier following an Imhoff tank and high-rate filter, reduced the B.O.D. from 183.8 lb. to 31.9 lb.; total suspended solids from 495.5 lb. to 83.6 lb.; and the volatile suspended solids from 287.7 to 39.9 lb.; the loadings on the clarifier including recirculation.<sup>P34</sup>

### Condition of Old Pipe Sewers

San Francisco has examined the condition of ten blocks of pipe sewers supposed to be 68 yrs. old in six blocks, 57 yrs. in three blocks and 37 yrs. in one. (Records were destroyed in the fire of 1906.) The diameters varied from 12" to 18", the grades from 1.2% to 10.1%. Wall thickness of the vitrified clay pipe varied from 1" to 1½" and the bells were considerably shorter than present practice. Wall thickness of the concrete pipe was 1¾" to 2", and the quality was very poor. Longitudinal cracks were numerous in both kinds, particularly at the spring line, but none of them had collapsed. There was little

erosion of inverts except in one block where the grade was 9.7%, and this was chiefly just below faulty joints.<sup>E30</sup>

### Landscaping Treatment Plants

In landscaping the sites of sewage treatment plants, three devices are used—grassed areas, shrubs and trees, and flower beds. At St. Petersburg, Fla., the terraces are planted with cocoanut palms. Griffin, Ga., uses weeping willows. Because of the objection of leaves blowing into outdoor tanks, there is general objection to deciduous trees; but Omaha, Gary, Ind., Birmingham, Mich., and Battle Creek use elms; Dallas uses oaks, pines and cedars; Birmingham uses, in addition to elms, white pine, flowering crabapple, Austrian pine and Norway spruce; Ft. Wayne uses Lombard poplars around digester and gas holder structures.

Among the shrubs used widely are bridal wreath, lilacs, forsythia, rambling roses, jasmine, spirea, barberry and hibiscus. Flowers are generally used sparingly. The most effective landscaping schemes depend on large expanses of grass, which provide beauty with minimum maintenance cost. The annual cost of keeping up the grounds was reported as \$400 at San Bernardino, \$2,400 at Dallas, \$800 to \$1,000 at Gary, \$500 at Battle Creek, \$240 at St. Petersburg. Green Bay expends 335 man-hours on lawns and 354 on shrubs and flowers.<sup>H50</sup>



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## Biofilter Operation

(Continued from page 25)

and is equipped with Dorr clarifier mechanism. Average detention in the summer is 3 hours; in the winter probably around 5 hours. The secondary recirculation pump draws from the secondary clarifier so that, while the inflow into the clarifier is 3 mgd during periods of recirculation, the overflow is always equal to the raw sewage volume.

It is always difficult to compute removals when recirculation is used, and it is especially difficult in this plant where the ratio of recirculation varies constantly with the raw sewage flow, and the volume of recirculation only is constant. Therefore, Fig. 6, which shows removals of BOD in the secondary clarifier during operation as a biofilter, is plotted on the basis of the strength of the influent—which is the strength also of the secondary filter effluent—and the strength of the effluent. The curve is a reasonably straight-line one, varying with the strength of the influent. Over the seven-year period that this plant has been in operation, the summer-time secondary clarifier effluent, with the plant used as a biofilter, has never exceeded an annual average of slightly over 20 ppm of BOD. Fig. 6 was made up by computing the average effluents for the various groupings of influents by strength, and the individual points are shown on the chart. The final effluents indicated by multiplying the influent strength and the per cent of BOD not removed agree very well with the average results that have been obtained. As a matter of fact, however, these do not

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represent plant effluent results. The effluent from the final settling tank is passed through a magnetite filter and the discharge from the plant averages slightly over 10 ppm of BOD.

#### Discussion and Comments

The data presented herewith, as stated in the first paragraph of this article, are merely for information. The fact that samples of raw sewage are based on composites from 8 A.M. to 2 P.M., and on effluent from 9 A.M. to 3 P.M. makes it difficult or impossible to correlate the data with those obtained elsewhere from 24-hour composites. Nevertheless, it is deemed worthy of presen-

tation, and some portions of the study should be of material value. Included in these are the loadings and removals on the two filters during both winter and summer operation.

If the data shown in Fig. 3 relating to the performance of the primary filters are reduced to a surface area basis, as advocated by the Upper Mississippi Basin Group, and are plotted on Fig. 12, "Relation Between Filter Loadings and BOD Reduction Through First Stage Filter and Clarifier," which is shown on page 56 of the March, 1943, report of that Group, it will be seen that the data given here for Liberty almost precisely parallel the curve given on

that chart. If an average reduction through the secondary clarifier of 37% is assumed (see Fig. 6 of this article) the curve is paralleled on the other side. There is an indication that the curve of the Liberty plant does not turn upward above the loading of 1.1 pounds of BOD per sq. ft. per day, as shown in Fig. 12 cited, but continues in more nearly a prolongation of the curve below this loading.

The excellent results produced by this plant is due, in no small measure, to the skilled operation provided by Harry Eichenauer, the plant operator, who has been in charge ever since the plant was built. For the most part, he has operated the plant without any assistants, except that personnel from the Street Department has been provided for sludge removal, and for similar work. John Lawrence is Superintendent of Public Works and is in overall charge of the sewage plant and of the street work.

#### Universal Concrete Pipe for Iceland

Universal concrete pipe is being sent to Iceland; 1368 tons of the pipe was recently ordered from the New York City office and was manufactured in the Kenvil, N. J., plant. In nine days, 10 miles of 6, 8, 12 and 15-inch pipe was moved by truck to the port for shipment. H. X. Eschenbrenner is president of Universal Concrete Pipe Co., and editor of "Pipe Dreams" which is a familiar and welcome little magazine; and Harry Leuliette and George Malfregot are vice presidents.

#### Refuse Disposal in Rocky Ford

The refuse disposal plan of Rocky Ford, Colo., has, through the monthly collection fee of 75c, raised enough money to purchase two garbage trucks. For this 75c fee, the city collects all types of garbage and trash and sprays the garbage cans with DDT.

#### Sewerage Publications

**Rapid Sand Filter.** The automatic backwash rapid sand filter, which is adapted not only for treating sewage effluents, but also industrial water supplies, municipal water treatment and raw water purification, is described in an excellent 12-page bulletin issued by Hardinge Co., Inc., York, Pa.

**Protective Coatings.** A 12-page bulletin gives complete details on the chemical and physical properties, application instructions, etc., on protective coatings needed by processes in 10 major industries. Name your problem and write to Amercoat Division, PO Box 3428, Terminal Annex, Los Angeles 54, Calif.

**Fight Water** is a condensed and easy-to-read pamphlet describing methods and products for sealing leaks against pressure and repairing structures above and below water line. A lot of information is given, with sketches showing what to do. Sika Chemical Corp., Passaic, N. J.

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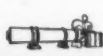
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## Construction Publications

*Going Places on Rubber* describes the equipment best suited to handle dam, road, airport and right-of-way construction where it is necessary to carry large loads for long distances. Form 10604, Caterpillar Tractor Co., Peoria 8, Ill.

*The Biggest Tractor*, the HD-19 by A-C, is described in a 6-page folder. The 40,000-pound weight, the 163-hp., and the hydraulic torque converter drive are covered. Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wisc.

*Scrapers* are described in two new booklets. One is devoted to the cable-operated type and the other to the hydraulic. The latter covers the 4-yd. scraper and describes the types of work to which it is best adapted. The cable scraper is made in 6, 8 and 14-yd. capacities and cost figures and methods of getting maximum production are given. LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa.

*Dirt-Moving Equipment*. New specification sheets are available on Ateco landleveling scrapers, bulldozers, road-builders and hydraulic PVT assemblies. Also a 4-page bulletin on the new two-wheel scrapers of 4.4 and 5.2 yards struck capacity. American Tractor Equipment Co., 9131 San Leandro Blvd., Oakland 3, Calif.

*Kentucky Highways*. Here is a 50-page booklet, with 100 illustrations, which describes scenic and historic spots along the State's main-traveled roads. Sent on request to Kentucky Dep't of Highways, Frankfort, Ky.

*Peru's Road Machinery Market* is a 16-page report by the ARBA on Peru as a present and potential market for road building machinery and allied equipment and parts. American Road Builders' Ass'n., 1319 F St., N. W., Washington 4, D. C.

*Reflective Glass Beads*, which by returning light to its source provide excellent material for highway markers and signals, and for safety and traffic guidance on streets, airports and highways, are described in a folder issued by Flex-O-Lite Mfg. Co., Inc., 3130 Chouteau, St. Louis, Mo.

*High-Speed Earthmover*, the Terra-Cobra, is described and the operational and construction features illustrated, with data on how to increase yardage on dirt-moving. Wooldridge Mfg. Co., Sunnyvale, Calif.

*Ranetite Waterproofing*. An improvement in the Ranetite No. V formula for waterproofing outside walls of brick, stone, stucco and similar surfaces has been announced. Circulars covering this new material and how to use it are available from Ranetite Mfg. Co., 1917 So. Broadway, St. Louis 4, Mo.

*Unitmotor*, a 2.4-hp. air cooled, lightweight, 4-cycle gasoline engine, weighing about 43 lbs. is described in a folder which can be obtained from Uebelhoefer Bros., Inc., 848 Kensington Ave., Buffalo 15, N. Y.

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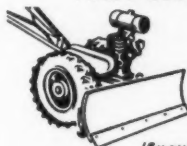
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# The Highway and Airport Digest

## Six Lanes for U. S. Highway 99

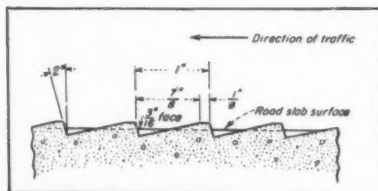
U. S. 99 passes through Bakersfield, Calif., as a 4-lane highway. Due to recent increase of commercial traffic and the considerable tourist travel, there were 175 traffic accidents in one year in a 1.9 miles length, 98 in a distance of four city blocks. Also the pavement structure was failing. To remedy this, the road has been widened to six lanes, two 12-ft. and one 11-ft. lane on each side of a 17-ft. curbed and planted median strip, with an 8-ft. parking lane bordering each edge. The right-of-way was 115.5 and 110 ft. wide, and the remaining 7 to 12.5 ft. was used for curbs, gutters and sidewalks. Due to the large number of left turns at several intersections, special storage lanes were provided by cutting into the median strip.

Low bearing ratios and the loose condition of the native soils required that excavation and compaction work be carried to a depth of three feet below profile grade. Only a small portion of the material excavated could be used in the fill because of its poor quality and was therefore disposed of by the Contractor. A 12-inch thickness of high quality imported borrow was placed beneath the pavement subgrade and where Portland cement concrete pavement was used, the upper 3 inches of the imported borrow was plant-mixed with 85-100 penetration paving asphalt to keep moisture out of the subgrade.

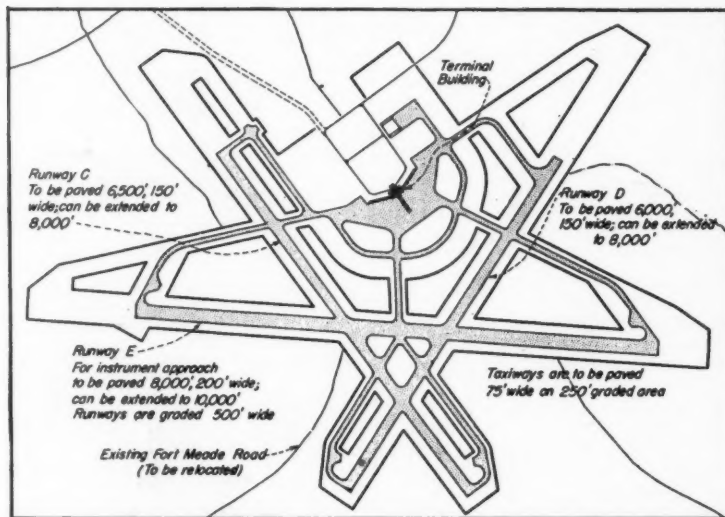
Most of the pavement was 3" asphalt concrete over old pavement or 7" of portland cement concrete. At one place where the old pavement was failing badly it was replaced with 8" of portland cement concrete.<sup>W8</sup>

## Skid-Proofing Kentucky Highways

Kentucky Dept. of Highways skid-proofs its asphalt pavements by use of sandstone rock asphalt, which consists of sharp, angular quartz sand impregnated with 6.2 to 8.5% bitumen, and is crushed for use. The pavement is first thoroughly



Courtesy Construction Methods  
Longitudinal section through surface of marker, showing corrugation details.



Courtesy Engineering News-Record  
The Baltimore airport's 3 runways will eventually be 8,000 to 10,000 ft. long.

cleaned. Then a prime of light MC-1 or MC-2 asphalt is applied as a mist by driving a distributor into the wind at 25 mph with the spray bar set 10 ft. above the pavement, distributing 0.05 to 0.10 gal. per sq. yd. This is covered with 6 to 10 lb. per sq. yd. of rock asphalt heated to 175° to 200° by means of a rotating sand spreader. This is applied in two applications, each dragged with a metal drag made of wire mesh guard rail. The cost is \$600 to \$1,000 per mile of 2-lane pavement.<sup>E44</sup>

## Reflecting Lane Markers

In New Jersey's Route 6 near Totowa a stretch of dual highway with twin 40-ft. 3-lane concrete roadways has been completed recently. Adjacent pavement slabs are separated by corrugated white concrete lane markers flush with them. Slabs 10" deep and 12 ft. wide were poured leaving a 2-ft. space between parallel lanes, which were filled with 9" of ordinary concrete topped with 1" of Atlas white cement mortar,

which was scored with a hand tool to make a shallow saw-tooth surface that reflects headlight beams back to the driver. They warn not only by light, but also by a whine from tires moving over them and by a slight vibration.<sup>810</sup>

## Grading Baltimore's Airport

Grading Baltimore's 3,000-acre airport is proceeding at the rate of 50,000 cu. yd. a day. The soil is sand and gravel so clean that even the largest tires sink in unless high speed is maintained. Most of the long hauling, over 2,000 ft., is over a haul road, in 13-yd. wagons filled by power shovels. For hauls of about 2,000 ft., carrying scrapers of 15 to 23 cu. yd. capacity drawn by 2-wheel tractors are used; for 1,000 ft. haul, 7-yd. carrying scrapers moved by 4-wheel tractors.

Special equipment is necessary for compacting this material. Sheepfoot rollers loaded to give 530 psi compact to 95-105%, modified Proctor test, at a depth of 2 ft., but the surface stays

Table 1—Equipment used to move 50,000 cu. yd. of sand and gravel per day

Equipment	Rated capacity cu. yd.	Moved by	Average load working	Average haul cu. yd.	Usual haul ft.	Average per unit per hr.
Carrying Scrapers.....	15	107 h.p. Track tractors	9	10	500	110
Carrying Scrapers.....	7	75 h.p. 4-wheel tractor	5	7	1000	80
Carrying Scrapers.....	15	150 h.p. 2-wheel tractor	12	10	2000	90
Carrying Scrapers.....	18	150 h.p. 2-wheel tractor	1	13	2000	105
Carrying Scrapers.....	23	225 h.p. 2-wheel tractor	1	18	2000	110
Bottom dump wagons..	13	4-wheel tractor	11	12	3000	55
Shovels	2		2	2.7		350

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loose and is compacted with a 200-ton weight on four 30" x 33" tires, drawn by a crawler tractor at 1½ mph, as speeds in excess of this do not allow sufficient time for entrapped air to escape.<sup>E45</sup>

### Unidirectional Airport Runways

In different localities, wind velocities for 39 to 100% of the time do not exceed 15 mph; therefore the prevailing annual all-velocity wind is very strongly influenced by the low-velocity winds; and the prevailing high-velocity winds are almost always in a direction different from the prevailing all-velocity winds.

Low-velocity winds are of little concern to the commercial airline but high-velocity winds are; therefore it is manifestly incorrect to locate a runway in the direction of the low-velocity winds. Wind data for a large Midwestern city showed that a single runway properly directed could be used by prewar transport aircraft 99.4% of the time throughout a 10-yr. period without encountering unsafe cross winds; and new postwar transports all but 4 hr. The author therefore advises the construction of a single paved runway based on the high-velocity winds, with sod runways at angles to this for personal aircraft. The advantages of a unidirectional runway are:

More possible sites closer to population centers; lower construction cost; easy and economical expansion; and much greater superiority for airline operation.<sup>F36</sup>

### Cleaning Streets in Cincinnati, O.

In Cincinnati last year 29,565 miles of streets were cleaned by machine sweeping at a cost of \$2.10 a mile; 13,529 miles by machine slushing at \$1.72 a mile; 10,149 miles by "white wings" at \$4.25; and 11,761 miles by broom drag at \$3.77. Of the 6 machine sweepers used, one has a 92" broom, 4 have 68" brooms, and one a 64" broom. Of 10 power flushers used, 5 are 3,000 gal., 2 are 1,800 gal., and one each are 1,500 gal., 1,000 gal. and 970 gal., the two last being alley type. There are 300 waste receptacles placed at strategic corners. Of the costs for gathering and removing litter, 67% is for that attributable to citizens in general, including dirt swept from sidewalks by merchants; 14% for snow removal; 9% for leaf removal; 3% for alley cleaning in congested districts; 6% for removing abrasives used for ice control; 1% for cleaning public markets, and 1% for cleaning up after stream floods.<sup>J20</sup>

### Vertical Sand Drains in a New Jersey Highway

In building 1.2 miles of fill on a "dual-dual" highway, Route 100, in New Jersey, which will have a total width of 200 ft., it is proposed to use vertical sand drains—one of the first applications of this method in the East. (See the *Digest* for October, 1946.) Much of the fill is on muck or other soft material of depths up to 24 ft. overlying firm material. The contract calls for placing 18,000 vertical drains with a minimum diameter of 18", 8 to 24 ft. deep, spaced 10 ft. apart. It is estimated that the use of this method will save the State about \$750,000, as compared to excavating 927,000 cu. yd. of undesirable material and replacing it with approved material, for which method \$1,920,977 was bid.<sup>E46</sup>

### Bituminous Construction on Roads

In 1946 over 6,000,000 tons of asphalt were used in paving in the United States, and the indications are that the use in 1947 will exceed this by 15%.

In resurfacing old pavement, it should be thoroughly cleaned and excess asphalt removed. It should be leveled with a fine-graded mixture, the coarser asphaltic concrete being used for the surface course if at all. Detroit has recently developed an excellent method of resurfacing old sheet asphalt, spreading ½" to ¾" thickness of sheet-asphalt mix using soft asphalt cement, using only 9 to 10% of 200-mesh filler.

Improvements in present surface treatment procedure will consist of greater use of pretreated aggregates and

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better spreaders. In road mixing, improvements are being made in machines for mixing even, finely divided soils in one passage. Another trend is in the delivery of premixed material to the road to be placed by the usual road mixing procedure, or delivering of unprimed or partly primed aggregate to a travel plant. The construction of penetration macadam for both foundations and surfaces is increasing considerably, as is also a combination of penetration macadam base and asphaltic concrete surface.<sup>941</sup>

#### Trends in Roadbuilding Equipment

Following are considered by the authors to be the present trends in the development of road building equipment:

Concrete paving:—1. Extended use of vibratory equipment for use with concrete spreaders. Increased use of air entrained concrete will probably have only minor effect on the use of such equipment.

2. Increased use of central-plant-mix concrete, transported to the job site in non-agitating dump bodies. The use of air-entrained concrete will favor this method.

Bituminous paving:—1. More accurate control devices for proportioning bituminous mixes for both continuous and batch-mix plants.

2. Increased use of pressure distributors, and more accurate control of rate of application.

3. Continued use of present mechanical spreading and finishing machines,

Soil compaction:—1. The trend toward heavier compaction equipment developed during the war for airfields will be reflected in highway construction. Higher densities will be specified as measured by the modified A.A.S.H.O. density test.

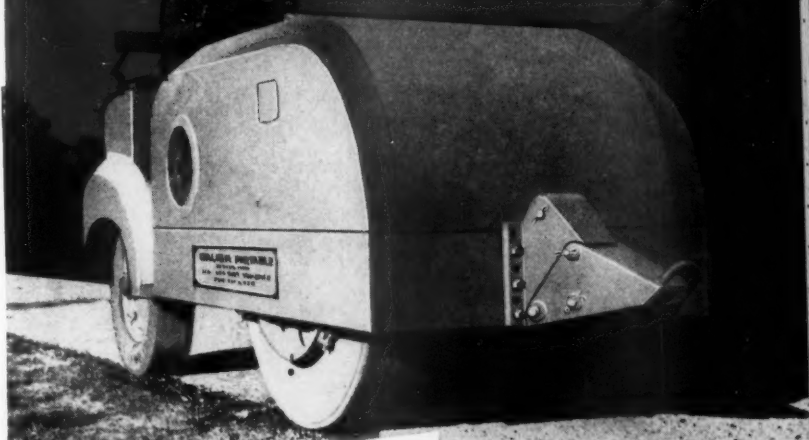
2. Vibratory equipment for compaction of granular soils will be used extensively. Use of the smaller vibratory units in places heretofore inaccessible to compaction equipment will reduce local failures due to long-time consolidation.

3. The possibility of depletion of the high-type granular materials for stabilization and the economies possible with the use of lower-type materials will force the increased use of the more efficient mixing and pulverizing machinery which has evolved during the past decade, and will spur development of such equipment.

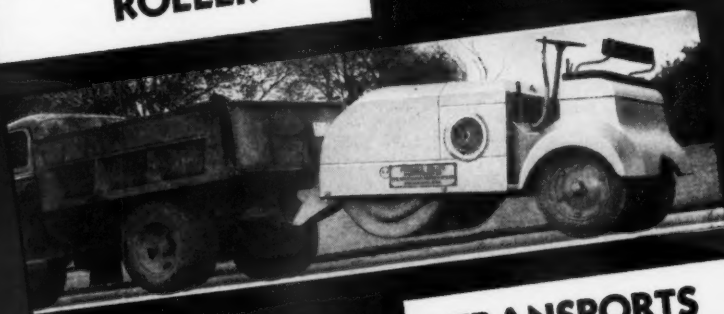
The 34E mixer seems to be the practical limit for pavers so far as size is concerned; additional capacity is obtained by use of the dual-drum. There is a demand for a continuous type of mixer, especially for small capacities. It has been proved that vibratory equipment gives a denser and more uniform concrete in highway construction. Truck mixers have advantages for small projects and short hauls, but their disadvantages are non-uniformity of mix, difficulty of control, and lack of positive discharge equipment, all of which can be corrected. Hauling concrete in non-

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agitating trucks is favored by use of well-proportional plastic mixtures and short hauls on smooth roads. Some trucks remix the concrete as it is dumped.

In bituminous mixing plants, the dryers have given trouble, probably because of overloading. The remedy suggested is providing several small dryers, to be used together or singly, as may be necessary. There is a demand for fully controlled plants with capacities of only 10 or 15 cu. ft. The greatest recent advancement has been in finishing and placing machines.

Capacities of earth-handling equipment have been greatly increased; an

elevating grader is in use capable of loading 1200 to 1500 cu. yd. an hour into 20 cu. yd. wagons. The weight of compaction equipment has been increased greatly, rollers of 50 to 60 tons being in use. In one case a 60 ton pneumatic roller gave 96% compaction with two passes over a 6" layer, where a 40-ton gave only 93% with three passes or more. Vibratory compaction shows great promise for granular soils. A number of manufacturers are working on heavy vibratory equipment. For soil stabilization, excellent results are obtained by the "Seaman-Pulvi-Mix," the "Wood Roadmixer" (a larger machine) and by the P&H "Single-pass

Soil Stabilizer," which digs, pulverizes, mixes and adds water, bitumen or calcium chloride under accurate control.<sup>040</sup>

### Multiple-Lane Highways vs. Dispersed Traffic

The multiple-lane highway is the best solution to traffic trouble in only a few cases; elsewhere they may produce more problems than they cure. The author recommends, instead of one multi-lane highway, dispersing traffic in a number of parallel 2-lane highways; the air would be better, the driver more relaxed, and a single wreck or stationary car can cause a long-continued serious jam on a highway where there are no alternate routes. Widening three existing 20-ft. 2-lane highways to 24 ft. has been found to cost less than constructing a 4-lane highway, and also the cost of maintenance is less.<sup>041</sup>

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- J American City**  
November
13. How to De-Soot an Asphalt Plant. By E. H. Rusch. Pp. 88-89.
14. Airport Snow Removal Principles. P. 93.
- K Proceedings, American Society of Civil Engineers**  
October
3. The General Principles of Highway Transition Curve Design. By John Joseph Leeming. Pp. 1257-1269.
- L Civil Engineering**  
November
15. Federal Aid System Provides Network of Arterial Routes in Urban Areas. Pp. 19, 86.
16. Rickenbacker Causeway Joins Miami with Nearby Keys. By Earle M. Rader. Pp. 26-29.
- N Roads and Streets**  
October
76. Working a 200,000 Cu. Yd. Borrow Pit. Pp. 59-61.
77. New Standards for Airports. By Lowell H. Swenson. Pp. 69-70.
78. Singing Separators. P. 71.
79. Rapid Moisture-Density Test. By F. A. Harris. Pp. 85-88.
80. Seeding Roadside by Hose. By Nelson M. Wells. Pp. 89-90, 113.
- O Roads and Bridges**  
September
40. Modern Trends in the Development of Roadbuilding Equipment. By H. F. Clemmer and Gayle Woods. Pp. 94-99, 158.
41. The Place of Bituminous Construction in Road Modernization. By Bernard E. Gray. Pp. 100-103, 150.



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42. Frost Action in Subgrades and Bases. By A. W. Johnson. Pp. 104-110, 146.  
 43. Air Entrapment in Concrete. By D. O. Robinson. Pp. 111, 154.  
 44. Solving the Urban Traffic Problem. By C. E. Campeau. Pp. 116, 118, 174.

**P Public Works  
November**

36. Rational Airport Planning: The Unidirectional Runway. By Edward Payson Hall. Pp. 19-21, 36.  
 37. California's Freeway Design and Construction. By Earl E. Sorenson. Pp. 26-27.  
 38. No More Winter Emergencies in Oneida, N. Y. By Albert T. Ernenwein. P. 33.  
 39. Racine Builds Pavement to Fit the Traffic. By W. J. Chadwick. Pp. 35-36.

**S Construction Methods  
October**

10. Ribbed White Concrete Markers. Pp. 88-90.

**W California Highways  
September-October**

6. Widening U. S. 99 to Six Lanes Will Reduce Traffic Accidents. By T. E. Whaley. Pp. 6, 26-27.

## Airports in Mexico

Until February 1, 1947, the government of Mexico had paid little attention to the airports of the country, but that month the President appointed Dagoberto Flores Calderon to head a new government bureau called the "Airport Office," its immediate function being to find out what Mexico has in the way of airports, what she needs and how it can be obtained. Flores found the airport situation in virtual "chaos." Nobody could even tell him how much airport space the nation had. As for the fields themselves, he says they were "built by anyone who wanted to, anywhere and in any way."

Every airport in the country has been surveyed. It was found that one of the most urgent needs of local flying fields is better runways. Even Mexico City's Central Airport, the finest in the country, possesses just one first-class runway. Only 8,000 feet long—short of the prescribed C.A.A. standard for DC-6 planes—it is nevertheless being used daily for this type of craft. In the interests of safety, work has already been started on the improvement of the Central Airport's runway.

A preliminary report embodies three alternative plans of action based upon:

(1) Mexico's airport needs on the basis of the current volume of plane traffic.

(2) Mexico's estimated airport needs three years from now.

(3) Mexico's estimated airport needs ten years from now.

It is believed that Plan Two is the most likely to win the President's approval. In Flores' opinion, Mexico requires three Class V (C.A.A. system of classification) aerodromes, 25 Class IV airports, 33 in Class III and 61 in Classes I and II.

In view of the commercial importance of airports in northwest Mexico, the plan will give priority to the improvement of aerodromes near the border with the United States. Thus airports in and around Mexicali, Guadalajara,

Mazatlan and Guanajuato will be among the first to receive the attention from the government.

One of the program's most important phases, naturally, will be the transformation of the relatively modest Mexico City airport into a luxurious air terminal worthy of the Mexican capital's position as the air link between North and South America. Under the project the present modest administration building will be replaced by a huge passenger station with rail, automobile, river and canal connections. In addition to ample landing space, the proposed aerodrome will have such conveniences as a hotel, a casino, a sports centre and

even an artificial lake with an island reachable by an automobile highway.

## Hydrated Lime in Soil Stabilization to Be Studied

Due to the successful use of hydrated lime in soil stabilization by the Texas Highway Department (see PUBLIC WORKS, June, 1947), the National Lime Association has sponsored a research project at the Engineering Experiment Station, Purdue University, under the direction of Prof. K. B. Woods. A prime purpose will be to discover the precise types of soils that respond favorably to lime treatment.



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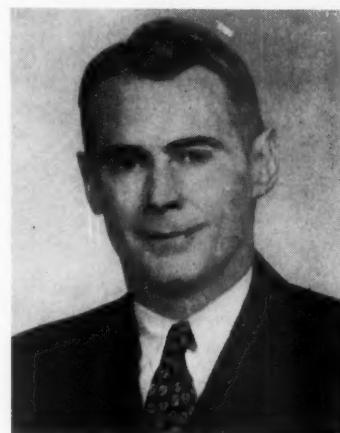
PUBLIC WORKS Magazine, 310 East 45th St., New York 17, N. Y.

D. R. Taylor, former assistant city manager of Roanoke, Va., has been appointed General Manager of the Baton Rouge Water Works Co., 131 Lafayette St., Baton Rouge, La.

Alden E. Stilson & Associates, consulting engineers have moved their offices to 209 South High St., Columbus, O.

J. A. Willman, former sanitary engineer of the Columbus, Ga., Health Department, has been appointed City Manager of Columbus.

Maurice Maskrey has been elected president of the Clay Sewer Pipe Association, succeeding H. C. Maurer, who died two years ago. Since that time, the



Maurice Maskrey

Association has been under the able guidance of Ben Eisner, chief engineer. Mr. Maskrey has had a long experience in the rubber industry.

Charles T. Main, Inc., consulting engineers, have moved to the fifteenth floor of the Chamber of Commerce Building, 80 Federal St., Boston 10, Mass.

Robert S. Taggart, who served in the Sanitary Corps of the Army, and has been district engineer for the New York State Department of Health at Amsterdam, has become assistant sanitary engineer for the National Biscuit Co., New York.

William M. Lee, who served during much of the war as chief of the chemicals and plastic section of the Army Quartermaster General, and with whom the editor of this magazine had many pleasant and valuable relations, has been appointed Supervisor of the Special Products Division, Research & Development Department, Pennsylvania Salt Co.

Truman A. Dunn, Bloomfield, Ind., has been appointed sales engineer by Pioneer Engineering Works, Minneapolis, Minn., and will cover Kentucky, West Virginia, Ohio, Indiana, lower Michigan and northern Illinois.

# PUBLIC WORKS Equipment News

## A Root Rake and a Stump Remover

This root rake removes top growth and roots in a single operation and disposes of the cutting without excessive piling up of soil. It can be used in road



Fleco root rake.

right-of-way clearing, for borrow pits, pipe line clearing, dam construction and ditch work—to mention a few of its uses. It is designed for Caterpillar D6, D7 and D8 tractors. The stump remover, not shown here, is an alloy steel casting designed to be attached to the frame of angling blade bulldozers. It can be attached or detached very quickly and easily. With it lateral roots can be cut and the stump pushed out. Full details from *Florida Land Clearing Equipment Co., Jacksonville, Fla.*



The Barber-Greene "Stockpiler" above and the unloader below.

## Reducing Fuel Cost of Diesel and Natural Gas Engines

An engineering development reduces by as much as 72% the fuel cost of engines burning diesel oil and natural gas and makes the gas-diesel engine the most efficient power unit ever created by man. It is applicable to municipal power plants, sewage plants and industrial operations. Results on a 1440-hp. installation in Oklahoma indicate that costs are \$33,214 less compared with the fuel cost of a diesel, \$3,174 less than a spark-ignited gas engine and \$1,394 less than the original gas-diesels. Full information on these new developments from *Cooper-Bessemer Corp., Mount Vernon, Ohio.*

## A New and Cheaper Method of Concrete Handling, Mixing and Pouring

This is a triple unit that picks aggregate up from the ground, handles it to a mixer, mixes and deposits the concrete. It is designed for small jobs. The self-loading weigh-batcher has a 2½-yd. capacity; the conveyor picks up the aggregate from the weigh-batcher and handles it into the mixer. The mixer fits on any short-base 1½-yd truck and weighs only 2,000 pounds. This outfit permits the use of bulk cement. Fuller information from *Steele-Wicker Co., 324 S. Beverly Drive, Beverly Hills, Calif.*

## Le Roi 85-Ft. Compressor on 2-Wheel Pneumatics

An 85-ft. Airmaster compressor has been announced by Le Roi Co., 1706 South 68th St., Milwaukee 14, Wisc. The compressor is built integrally into the engine block and is regulated by the Le Roi econotrol automatically according to the demand for air. Electric starting and electric hourmeter are standard equipment. Full data on request.

## Unloader and Stockpiler Speed Aggregate Handling

This new unloader is said to be able to unload a car of stone or gravel in 45 minutes. V-belt drive, towing hitch, pneumatic tires and shock absorbers are among its features. The unloader is designed to be used in conjunction with the new portable stockpiler, also shown herewith. This has a belt width of 24 ins. and is made in lengths of 25, 30 and 35 ft. Full details on these can be obtained by writing *Barber-Greene Co., Aurora, Ill.*



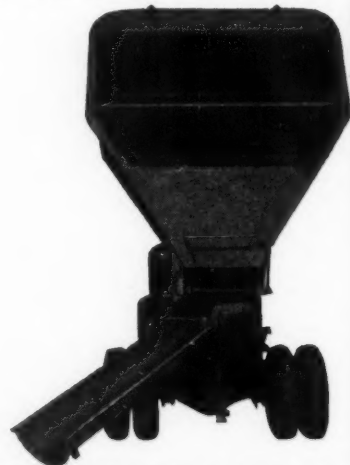
The Gardenaid snow plow-grader is fine for plowing sidewalks.

## Pulls Sheet piling and Posts; Handy on Construction

This is a handy little jack-hoist, with a capacity of 2000 pounds, though it weighs only 23 lbs. Will pull posts and trench sheeting and lift heavy equipment. Ask for information on this hoist-jack from *Coffing Hoist Co., Danville, Ill.*

## A Tractor-Mounted Shovel for Public Works Jobs

This power shovel weighs only 4 tons, but it handles a 0.52-yd. or 0.6-yd. bucket (also a 1.25-yd. bucket for light material) and has a dumping clearance of 6 ft. 8 ins. It digs, carries and loads; it



This body, primarily for hauling and placing air-entrained concrete, is made by Hercules Steel Products Co., Galion, O. See page 63, November Public Works.

travels at speeds of 2 to 30 mph. It is designed especially for doing the many jobs that arise in city and country work. For a full description, with operating details, write *Lessman Mfg. Co., Des Moines 4, Ia.*

### A Tail Gate Loader With Many Public Works Uses

This is a tail gate loader, hydraulically operated by power take-off. It should be excellent for loading larger valves, pipe fittings, etc., for the water department; large sewer pipe and tools for sewer work; and tools and equipment, such as small pumps, small concrete mixers and all the other things that are used frequently by cities and counties, and that are heavy to handle and put into a truck. Full information from the *Day Co., 306 W. 69th St., Chicago 21, Ill.*



Flexible "Carry-All" trailer.

### A Small Crushing and Screening Plant

This new plant has a capacity, at 1½-inch setting, of 10 to 15 tons an hour for the 1016 crusher and 15 to 25 tons an hour for the 1024 crusher. It weighs 13 tons, and has a 3-compartment, 20-yd. bin. It consists of a jaw crusher, bucket elevator and transfer conveyor, all mounted on a 4-wheel trailer. A 50-hp. gasoline or diesel engine furnishes the power. The bucket elevator folds

back during transit. *Pioneer Engineering Works, Minneapolis 13, Minn.*

### GE Praised for "Clean Waters."

The well-known film, "Clean Waters," which has been a big factor in better waste treatment and public education, has been named as one of the world's six outstanding sponsored films by the Films of the World Festival. For once, we are entirely in accord with the movie folks.

### Easy-to-Handle Trailer for Moving Sewer Cleaning Equipment

A "carry-all" type of trailer for handling sewer cleaning equipment can be attached to a car or truck for quick movement. This unit carries a rodding outfit, pipe guide, power drive, rod reel and stand, hose, picks, shovels, rope, red flags, etc. It is a 2-wheel, all steel, pneumatic-tired trailer. *Flexible Sewer-Rod Equipment Co., 9059 Venice Blvd., Los Angeles, Calif.*

## CUT TALL GRASS...WEEDS... BRUSH *Faster and Easier*

Ideal for water works, sewage plants, parks, playgrounds, airports, vacant lots, roadsides, tourist camps. Mows fast and clean around trees, fences, buildings, tanks, and tight places. Self-propelled. Easy to handle on rough ground or steep slopes. Does work of eight men. Easy for one man to load on truck. Rugged. Dependable. Economical.



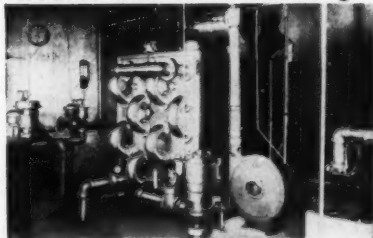
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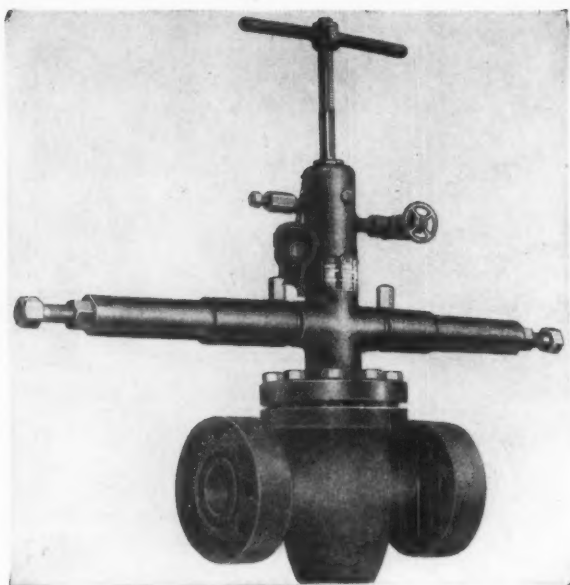
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## THE GOLDAK CO.

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Right, the 175 can carrier for street sweeping work. It has machine bored wheels, welded construction and is made for long life by Tarrant Mfg. Co., Saratoga Sprgs., N.Y.

Left, the Otis pressure valve described herewith.

### A Valve to Prevent Line Breaks or Shut Off a Broken Line

The Otis surface safety valve is designed to prevent line breaks caused by excessive pressure increases or to shut off the flow from a broken line. It is a full opening gate valve which closes whenever operating pressure goes above or below that for which the valve is set. It is operated by line pressure and all connections are within the valve itself. More information from *Otis Pressure Control, Inc., Dallas, Texas.*

### Johns-Manville Research Center

The largest laboratory in the world devoted to building materials, insulations and allied industrial products—and probably the most modern and carefully planned—has been put into service by Johns-Manville at Manville, New Jersey. This, however, is only the first unit; ultimately the research center will be composed of five or six buildings, grouped around a quadrangle. The entire tract covers 93 acres. The

first building, two stories high and 572 ft. long, will house 10 pilot plants, each with its own special laboratory. Dr. C. F. Rassweiler, who is vice-president for Research and Development of Johns-Manville Corp., planned and supervised construction of the new research center and will direct its activities.

### For Better and Quicker Pipe Joints

Here is a rubber joint, flexible and easy to install, which is said to eliminate leakage and infiltration. It can be used with a bell-and-spigot joint or with a tongue-and-groove joint. It is available for pipe from 4" to 84". Full information in a bulletin which will be sent on request to *Hamilton Kent Mfg. Co., Kent, Ohio, attention T. S. Rowe.*

### Diaphragm Pump, 1,000 to 6,000 GPH

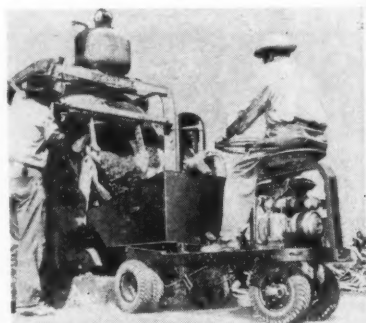
This is a diaphragm pump, newly developed, in 3-inch and 4-inch sizes; capacities 1,000 to 6,000 gph; recommended for suction lifts to 20 ft., but



can be used up to 25 ft. Handles sludge, mud, seepage, sewage, slime and other fluids up to 25% solids. Available with gasoline engine, electric motor or no power; mounted on rubber or steel wheels or skids. Information from *Carver Pump Co., Muscatine, Ia.*

### Motorized Wheelbarrow Hauls Anything

One man with this motorized wheelbarrow can do the work of 6 men with ordinary wheelbarrows. It handles wet

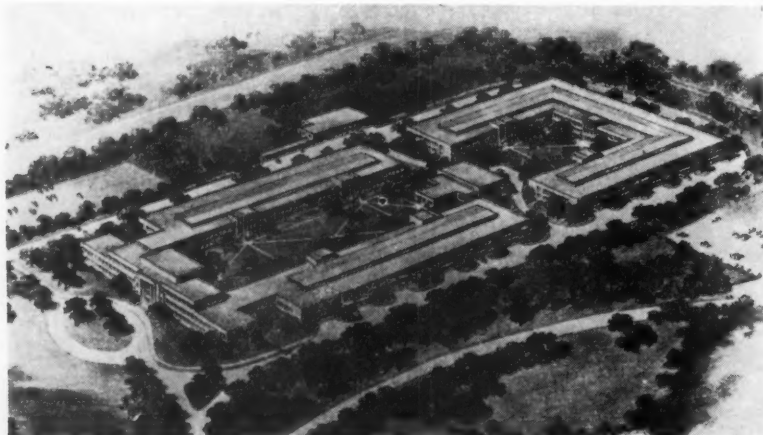


The motorized wheelbarrow.

concrete, dirt, brick, aggregate and construction materials; it handles 2000 pounds or 12 cu. ft. at speeds from 2 to 15 mph.; forward and reverse speeds; weighs 750 pounds; turns in its own radius. You can get lots more information on what this handy tool will do by writing *Whiteman Mfg. Co., Los Angeles 26, Calif.*

### Loading, Digging, Pile Driving, Ditching and Backfilling

This bantam shovel is truck-mounted, and has a 0.33-yd. bucket. It is mobile and versatile. It will load materials, as either a shovel or a clamshell; drive piles; dig ditches, using the "moles paw" in sticky ground; backfills; and it can be used as a drag line. It is mounted on any standard 1½-ton truck. Weight complete is 4 tons. Full information from *Schild Bantam Co., Inc., Waverly, Iowa.*



The new Johns-Manville Research Center.



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These helpful booklets are free to those actively engaged in engineering or construction. Mail coupon or write direct to addresses given, mentioning PUBLIC WORKS Magazine.

## NEW LISTINGS

### Speed Maintenance With This Portable Air Compressor

1. LeRoi Portable compressors in sizes from 60 to 500 c.f.m., gasoline or Diesel powered on mountings to fit your special needs. Same manufacturer makes both compressor and engine. Complete bulletin. Write LeRoi Company, 1770 So. 68th St., Milwaukee 14, Wis.

### Won't a Small Tractor Help You?

551. If your problem calls for a snow plow-grader or a power mower, Gardsaid Tractors provide an efficient, economical solution. For full data write Dept. PW, Eastern Tractor Mfg. Corp., Kingston, N. Y.

### New Ideas in Economical Swimming Pool Designs

552. Bintz Pools, a combination pool and bathhouse, saving 25-40% in cost with a dozen advantages over the conventional sunken pool and bathhouse; and Ovoid Pools, saving 100% with 4 or 5 advantages over the conventional rectangular pool field by Wesley Bintz, Consulting Engineer, Civil, Swimming Pool Designs, Park Layouts, Memorial Buildings and Allied Structures exclusively, 301½ S. Washington Ave., Lansing 25, Mich. Complete information on request.

### Power Mower for Water Works, Sewage Plants, Highways, Etc.

553. For cutting the grass around your Water and Sewage plants and removing weeds and tall brush along your highways the Jari power scythe is just the thing you need! For a booklet describing this mower which is said to be easy to handle, economical to operate, fast and clean around trees and can be handled by one man write Dept. PW, Jari Products, Inc., 2936-F Pillsbury Ave., Minneapolis 8, Minn.

### Save Time and Labor by Using a "Black-Topper"

554. The Etnyre "Black-Topper" is a bituminous distributor that will save you time and labor on the job. For bulletin giving details of the accurate, dependable and economical performance of this distributor write Dept. PW, E. D. Etnyre & Co., Oregon, Ill.

### Tired of Digging at Random?

555. There's a better way to locate leaks or "lost" pipe, valves, etc. New literature showing latest models of Pipe Finders, Leak Locators, etc., is offered free by Fisher Research Laboratory Inc., 1961-65 University Ave., Palo Alto, Calif.

### Need Snow Plows or Parts?

556. Walsh Holyoke Boiler Works, Inc., Holyoke, Mass., announce manufacture of Sargent Snow Plows and that they can now supply parts for them. For details address them as above.

### New Complete Handbook On Belt Conveyors

557. Here's a brand new handbook just off the press. 160 pages of diagrams, specifications tables, etc. The book is a most complete reference on the subject of belt conveyors. To add a copy of this handbook to your files fill in the coupon on page 12 or page 69. If you prefer write direct to Jeffrey

Mfg. Co., 947-99 No. Fourth St., Columbus 16, Ohio.

### Water, Gas, Sewer Pipe Line Equipment

558. Joseph G. Pollard Co., Inc., 145 Ashland Place, Brooklyn, N. Y. Eastern Distributors for the Fisher M-Scope, has issued a catalog No. 24 which describes the mechanisms manufactured by the company for maintenance and construction of pipe lines, melting furnaces and torches, pouring pots, dippers, pails, derricks, tools, joint runners, pipe cutters, hydrant testers, thawers, sewer cleaning machines and similar equipment.

## CONSTRUCTION MATERIALS AND EQUIPMENT

### Handle All Kinds of Tough Grading Jobs Economically

98. The Austin-Western 99M Power Grader with its powerful all wheel drive handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow ploughing, loading, mixing, bulldozing, shoulder trenching and backslapping. Write for Bulletin 1946. Dept. P.W., Austin-Western Co., Aurora, Ill.

### Save Money, Busting, Cutting, Digging, etc.

110. Powerful self-contained gasoline hammers illustrated in new booklet. Used as paving breakers and spike drivers. Easily portable, economical. Write Syntro Co., 660 Lexington, Homer City, Pa.

### Methods of Installing Steel Sheet Piling

112. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., Dept. P.W., 1820 No. Central Ave., Chicago 39, Ill.

### Reliable Every Purpose Pumps

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

### Strong, Speedy, Low-Cost Maintainer Has Many Uses

130. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. P.W., Marion, Ohio.

### For Reliable Low-Cost Light and Power Anywhere

392. 20-page catalog P.W. describes "Dieselectric" plants 3 to 10 KVA, and diesel engines from 4 to 12 H.P. These are easily transported and will produce reliable, low cost light and power anywhere. Write WITTE ENGINE WORKS, Division of Oil Well Supply Company, Kansas City 3, Mo.

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422. New booklet describes Sheppard Diesel Generating Sets that make low cost electricity from cheap fuel and give dependable service in the hands of any average operator. Write R. H. Sheppard Co., 250 Middle St., Hanover, Pa.

### The 32 Basic Advancements in the New Ford Trucks

522. Beautiful new catalog explains the 32 basic advancements of the new Ford trucks. Gives engine specifications, 138 pictures show special features of engines, chassis and some body models. Send for your copy. Truck and Fleet Sales Dept., Ford Motor Company, Dearborn, Mich.

### One to Two H.P. Air Cooled Engine for Dependable Power

523. New bulletin illustrates many uses for Clinton 1 to 2 H.P. gasoline engines. Gives full specifications and power data. An economical, long lasting power unit. Write Dept. PW, Clinton Machine Co., Clinton, Mich.

### Air Cooled Engines for Hundreds of Applications

524. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "night" power for hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wis.

### Have You Floor Troubles?

550. Stonhard Company has the answers for rough, rutted concrete or wood floors. 48-page booklet tells all about how to resurface them without calling in outside help. Address: Stonhard Company, 883 Terminal Commerce Bldg., Philadelphia 8, Pa.

## SNOW FIGHTING

### For High-Speed Snow Removal

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 3 tons capacity. Interchangeable with V Sno-Plow. Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

### End Dangerous Ice Hazards

354. Ice Prevention on Highways, Streets, and Airport Runways with Sterling "Auger Action" Rock Salt. Illustrated bulletin P.W. issued by International Salt Co., Inc., Scranton, Pa.

**Fast, Efficient Skid-Proofing**

355. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. cap. Write Dept. P.W., Baughman Mfg. Co., Inc., Jerseyville, Ill.

**STREETS AND HIGHWAYS****Levels Sidewalks and Curbs Quickly and Easily**

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

**Speed Your Work With These Powerful Motor Graders**

128. Two powerful Gallon motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Gallon Iron Works & Mfg. Co., Galion, Ohio.

**Tandem, 3 Wheel and 3 Axle Road Rollers**

133. "The Buffalo-Springfield" line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog P.W. issued by the Buffalo-Springfield Roller Co., Springfield, Ohio.

**Mix-in Place Roadbuilders Save on Scarce Labor**

187. Mix-in Place Roadbuilders. Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs in one cover, issued by the Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

**Here's Your Diesel Tractor!**

190. Big 48 page catalog describes and lists many uses for International Diesel Tractors. Write International Harvester Co., Dept. P.W., 180 North Michigan Ave., Chicago 1, Ill.

**Mow Clean and Fast In Tight Corners**

510. Send for latest literature about the Cunningham Mower for Fence Rows, Parking Areas, Driveways, Picnic Grounds and many other jobs. 3 ft. cut, variable speed, rugged, easy to handle. James Cunningham, Son & Co., Dept. 16, 13 Canal St., Rochester 8, N. Y.

**Protect Your Grade Crossings With Model 10 Signals**

548. Bulletin G15-PW12 describes and illustrates the automatically operated Model 10 railroad crossing signal. Folder describing this signal which guards against "second train" accidents and permits fast flow of rail and highway traffic is available on request from Western Railroad Supply Co., 2406-2436 South Ashland Ave., Chicago 8, Ill.

**SEWAGE DISPOSAL****Non-Corrosive, Long Lasting Low Cost of Sewer Pipe**

72. Get this new engineering data on clay pipe for sewers. Withstands acid, alkali and gas attacks indefinitely. Cuts maintenance costs to a minimum. Write Dept. P.W., National Clay Pipe Mfrs., 111 W. Washington St., Chicago 2, Ill.

**How Cities Can Do Complete Sewer Cleaning From Street**

387. Literature illustrating how cities, towns and villages using OK Champion

Sewer Cleaners are doing a complete sewer cleaning job from street level. Three sizes of machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4732 Sheffield Avenue, Hammond, Indiana.

**Do Your Water Mains Need Cleaning?**

388. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

**All About Flow Meters**

409. The primary devices for flow measurement—the orifice, the pitot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (No. 300). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

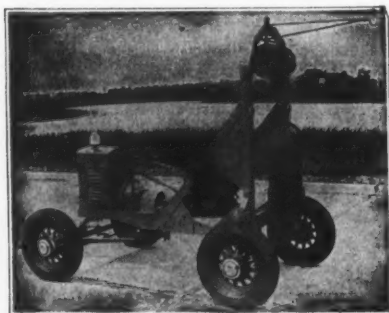
**Need Street, Sewer or Water Castings?**

429. Street, sewer and water castings in various styles, sizes and weights. Man-hole covers and steps, inlets and gratings, adjustable curb inlets, water meter covers, cistern and coal hole covers, gutter crossing plates, valve and lamphole covers, etc. Described in catalog PW issued by South Bend Foundry Co., South Bend 23, Ind.

**How to Select Main Line Meters**

432. New bulletin illustrates Builders Air Relay system for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. "The Selection of Main Line Meters," a highly informative and useful presentation, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Provident, Inc., Dept. P.W., 9 Codding St., Providence 1, R. I.

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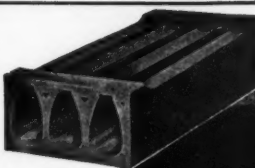
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**How to Make Concrete Pipe on the Job**

440. Making concrete pipe on the job with local labor is the subject of a booklet sent on request by Quinn Wire & Iron Works, 1621 12th St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms.

**Concrete Pipe With Greater Elasticity**

442. Lock Joint Reinforced Concrete Sewer Pipe, Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

**How to Make Better Sewer Pipe Joints**

447. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Dept. P.W., Adams, Mass.

**Save Trucks and Labor in City Rubbish Collection**

459. For saving trucks, labor, and time in city rubbish collection get details of the new Dumpster-Kolektor described in literature just published by Dempster Brothers, Inc., 996 Higgins, Knoxville 17, Tenn.

**An Incinerator Necessity**

463. Recupercator tubes made from Silicon Carbide and "Fireclay" Corebusts for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recupercator Co., Dept. P.W., Plainfield National Bank Bldg., Plainfield, N. J.

**How You Can Dispose Of Sewage Solids**

464. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates

and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. P.W., Nichols Engineering and Research Corp., 60 Wall Tower, New York 5, N. Y.

**Ask for This Design Data On Sprinkling Filters**

469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., Dept. P.W., 4241 Ravenswood Ave., Chicago 13, Ill.

**Packaged Sewage Treatment—Just Right for Small Places**

488. "Packaged" Sewage Treatment plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

**Look Into This Sewage Treatment Equipment**

490. New bulletin P.W. fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Dept. P.W., Hardinge Company, Inc., York, Pa.

**Glazed Clay Blocks for Trickling Filter Underdrains**

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

**How to Stabilize Lime Softened Water**

498. Engineering Bulletin describes stabilizing lime-softened water by recar-

bonation, discusses gas production, washing, compressing, drying, and applying the CO<sub>2</sub> (2). Inflico, Inc., 325 West 25th Place, Chicago 16, Ill.

**Low Cost Air for Sewage Disposal**

602. All interested in low cost air for sewage disposal will want a copy of this useful booklet. Describes operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

**WATER WORKS**

**Hydraulic Pipeline Scraper For Water and Sewage Mains**

382. For a copy of this compact folder on a hydraulic pipeline scraper which cleans all kinds of mains from 4 inches to 14 inches write to Dept. P.W., Carver-Stimpson Pipe Cleaning Co., Walters, Okla.

**Solve Corrosion Problems With This Special Alloy**

391. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

**To Measure, Mix, Feed Chlorine or Other Gases**

397. Everson SterElators. Bulletin 1063, 1066, 708 and others describe this device for measuring, mixing and feeding chlorine or other gases in solution. Capacities range from 1/4 lb. to 2,000 lb. of gas per 24 hours. Address: Everson Manufacturing Co., 214 W. Huron St., Chicago 10, Ill.

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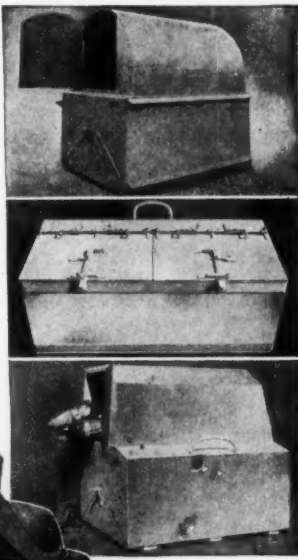
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400. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioners, Inc. %, 96 Coddling St., Providence 1, R. I.

### 88 Page Book Helps Solve Water Problems

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 88-page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

### Quick Way to Locate Leaks and Pipe

426. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetite Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

### Find Your Leaks In a Jiffy

427. For tracing buried pipes and finding hidden leaks get details of Allen-Howe Leak Detectors, Pipe Locators, Dipping Needle and Pipe Phones. Ask for new circular P.W. 6, Allen-Howe Electronics Corp., 150 Main St., Peabody, Mass.

### What You Should Know About Meter Setting and Testing Equipment

431. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet P.W. you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

### Cast Iron Pipe and Fittings For Every Need

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. P.W., Burlington, N. J.

### Do You Have This Data On Cast Iron Pipe?

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., Dept. P.W., Public Ledger Building, Independence Square, Philadelphia 5, Pa.

### Makes Underground Pipe Installations Easy

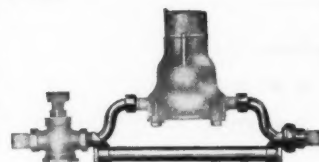
444. One-man-operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117, Greenlee Tool Co., 2042 Columbia Ave., Rockford, Ill.

### Interesting Facts About Transite Pipe

445. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., Dept. P.W., 22 East 40th St., New York 18, N. Y.

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The Linesetter raises the meter only 2 1/2" above the service line level, making it ideal for shallow outside settings and basement installations.

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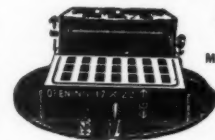
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No. 16

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PUMPS • HOISTS • LIGHT PLANTS



**SIMPLE  
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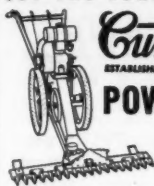
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**POWER MOWER**

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is Best for  
locating leaks!

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2. The super-sensitivity of the Globe Geophone (it operates on the seismograph principle) can be relied on even when 50 to 75 ft. from a leak.

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How to Estimate Quantity  
Of Joint Compound Needed

450. The uses of Tegul-Minerallead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Data on High Efficiency  
Well Water Systems

454. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklet P.W., Adv. Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

Oil or Water Lubricated  
Turbine Pumps

456. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., Dept. P.W., 600 So. Michigan Ave., Chicago 5, Ill.

Here's Data on All  
Kinds of Pumps

458. Performance data and illustrations on all kinds of pumps for all uses. Address: Dept. P.W., American Well Works, Aurora, Ill.

Are You Thinking About  
A Swimming Pool?

472. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Eliminate Taste and Odor  
From Your Water

474. Technical pub. No. P.W. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination. Sent free to any operator requesting it.

Treating Water With  
Copper Sulphate

496. "Use of copper sulphate in water treatment plants" contains valuable data on chemicals, dosage, etc. Ferri-Roc Ferric Sulphate—a new, valuable booklet P.W. on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

Outdoor Water Service Devices  
That Do Not Freeze

506. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., contained in Catalog L. Sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

## Find Buried Pipe and Leaks

545. Finding Buried Pipe, Leaks is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Calif.



## WINTER ROOF LEAKS come suddenly!

Will you have to put in an emergency call for roof repairs this year? No, you won't... not if you use STONHARD ROOF RESURFACER, because the use of STONHARD Roof Resurfacer now will assure you of a waterproof and weatherproof roof this winter, when you really need it most, and in addition will add years of life to your old roof. STONHARD stops leaks instantly!

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## AN "EARLY-BIRD" NAME

Bronze and brass will not be plentiful next year.

The lack of it can delay deliveries beyond a reasonable period.

Supts. of Water Depts. will perceive the wisdom of placing orders for MURDOCK Drinking Fountains and Hydrants EARLY to insure early deliveries. First in, first out.



The Murdock Mfg.  
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Cincinnati 2, Ohio

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This valuable booklet "Modern pH and Chlorine Control" contains information of value to all water and sewage works men. Ask your dealer or write direct.



**W. A. TAYLOR AND CO.**  
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## American Roadbuilders' Association

The Road Builders' Conference will be held in Washington, D. C., Jan. 26 to 28, at the Mayflower, Statler and Willard Hotels. An excellent technical program has been arranged. For copies, write to the ARBA, 1319 F. St., NW, Washington, D. C.

## American Society of Civil Engineers

The annual meeting of the ASCE will be held at the Hotel Commodore, New York, Jan. 21 to 24. The Spring meeting will be held at the William Penn Hotel, Pittsburgh, Pa., April 7-9. The summer convention will be held at the Olympic Hotel, Seattle, Wash., July 21-23. The Fall meeting will be at the Statler Hotel, Boston, Oct. 13-15.

## New England Section, Institute of Traffic Engineers

At a recent meeting of this section, the following officers were elected: President, E. W. Osterhoudt, Traffic Engineer, Connecticut State Highway Dept.; vice-president, W. E. Billings, Director of Traffic Safety of the Liberty Mutual Insurance Co.; and secretary-treasurer, Charles S. LeCraw, Jr., Resident Traffic Engineer of the Eno Foundation, Westport, Conn.

## Dinner to James C. Harding

The Westchester County Chapter of the New York State Society of Professional Engineers gave a testimonial dinner to James C. Harding, County Commissioner of Public Works, on Nov. 13.

## JOBS FOR ENGINEERS

A position as Associate Professor of Sanitary Engineering at Texas Agricultural & Mechanical College, College Station, Texas, is open. This position pays about \$400 to \$500 per month on a 9-month basis. Familiarity with design and operation of water works and sewerage is essential. It is desired to fill this position by Feb. 1, 1948. Write to Prof. S. R. Wright, Head, Department of Civil Engineering, at the above address.

An engineering school in the east desires a man to head its civil engineering department; it prefers a man with sanitary and hydraulic training and experience, preferably not over 42. Initial pay is \$6900. Personality and ability in leadership are essential. Write to GB, care of the Editor of this Magazine.

### WANTED

Dragshovel for Model 25 Bay City Crane. Getman Brothers, General Contractors, South Haven, Michigan.

### HELP WANTED

Bldg. Specif. Writers for arch. work—perm. Civil Service \$395 & \$440 mo. Annual increases, Sick Leave, Retirement. L. A. County Civil Service Rm 102, Hall of Records. Los Angeles 12, Calif.

## Advertising Index

Allbright & Friel, Inc.	64
Allen-Howe Electronics Corp.	42
Alvord, Burdick & Howson	64
American Brass Co.	17
Austin-Western Co.	12
Baker, Jr., Michael	64
Banister Engineering Co.	64
Barker & Wheeler	64
Baughman Mfg. Co., Inc.	63
Binz, Wesley	64
Black & Veatch	64
Bogert-Childs Engineering Assoc.	64
Bowe, Albertson Assoc.	64
Briggs & Stratton Corp.	1
Buck, Seifert & Jost	64
Buffalo-Springfield Roller Co.	62
Builders-Providence, Inc.	4
Burns & McDonnell Eng. Co.	34 & 6
Burrill & Assoc., Harold G.	64
Caine Steel Co.	43
Caird, James M.	64
Carver-Stimpson Pipe Cleaning Co.	4
Cast Iron Pipe Research Assn.	14
Champion Corp.	70
Chester Engineering Corp.	64
Chicago Pump Co.	3
Clinton Machine Co.	39
Cole & Son, Chas. F.	64
Consoer, Townsend & Assoc.	64
Cunningham Son & Co., James	73
Dempster Bros.	7
Dow, A. W., Inc.	6
Eastern Tractor Mfg. Corp.	5
Entyre, E. D.	4
Fairbanks-Morse & Co.	47
Fisher Research Laboratory, Inc.	41
Fitch Recuperator Co.	36
Flexible Underground Pipe Cleaning Co.	72
Ford Motor Box Co.	52
Ford Motor Co.	1
Frink Sno-Plows, Inc.	6
Gallon Iron Works & Mfg. Co.	81
Gannett, Fleming, Corddry & Carpenter, Inc.	64
Globe Phone Mfg. Corp.	73
Goff, William A.	64
Goldak Co., The	67
Goodwin Engrg. Co., J. W.	64
Gorman-Rupp Company	6
Greeley & Hansen	64
Green Co., Howard R.	64
Greenlee Tool Co.	40
Hardinge Co., Inc.	58
Hardy Co., John J.	61
Hill & Hill	6
Huber Mfg. Co.	6
Hydraulic Development Corp.	71
Infilco, Inc.	41
International Harvester Co.	4 & 59
International Salt Co.	59
Jaeger Machine Co.	43
Jari Products, Inc.	67
Jeffrey Mfg. Co.	12
Johns-Manville Corp.	33
Kennedy, Clyde C.	65
Koehring Company	43
Layne & Bowler, Inc.	44
Lewis, Harold M.	65
Lock Joint Pipe Co.	78
Lozier & Co., Wm. S.	65
Metcalf & Eddy	65
Moore & Owen	65
Murdoch Mfg. & Supply Co.	17
National Clay Pipe Mfrs., Inc.	74
National Fireproofing Corp.	70
Nichols Engrg. & Research Corp.	37
Pacific Flush Tank Co.	67
Pelphs, Inc., Boyd E.	65
Pirnie Engineers, Malcolm	65
Pollard Co., Inc., Joseph G.	41
Proportioners, Inc.	51
Quinn Wire & Iron Works	65
Robert & Co., Inc.	5
Roberts Filter Mfg. Co.	5
Roots-Connorsville Blower Corp.	53
Russell & Axon Cons. Engrs., Inc.	65
Sheppard Co., Inc., R. H.	10
Simplex Valve & Meter Co.	18
Sirrine & Co., J. E.	65
Smith & Gillespie	65
South Bend Foundry Co.	72
Stanley Engineering Co.	72
Sterling Machinery Corp.	65
Stilson & Assoc., Alden E.	73
Stonhard Company	73
Syntron Co.	72
Taylor, Henry W.	65
Taylor & Co., W. A.	74
Tennessee Corp.	56
U. S. Pipe & Foundry	53
Universal Concrete Pipe Co.	53
Wallace & Tiernan Co., Inc.	B. C.
Walsh Holyoke Boiler Div.	F.
Western Railroad Supply Co.	13
Weston, L. A.	70
Witte Engine Works	40
Wood Co., R. D.	40



Index

64  
42  
64  
17  
15  
64  
64  
64  
63  
64  
64  
6  
64  
1  
64  
62  
4  
34 & 6  
64  
43  
64  
4  
Co.  
14  
70  
64  
3  
3  
64  
64  
73  
7  
6  
5  
4  
47  
41  
3  
ing Co.  
72  
66  
61  
64  
73  
64  
67  
64  
6  
64  
64  
40  
54  
61  
6  
71  
41  
4 & 16  
59  
43  
67  
12  
35  
65  
42  
44  
65  
73  
65  
65  
74  
17  
70  
37  
67  
65  
41  
51  
40  
65  
3  
65  
65  
18  
65  
65  
73  
65  
73  
65  
73  
65  
73  
65  
74  
50  
33  
31  
B.C.  
F.  
13  
6  
6